News of the Industry Begins Page 175

# AUTOMOTIVE INDUSTRIES

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Number 6

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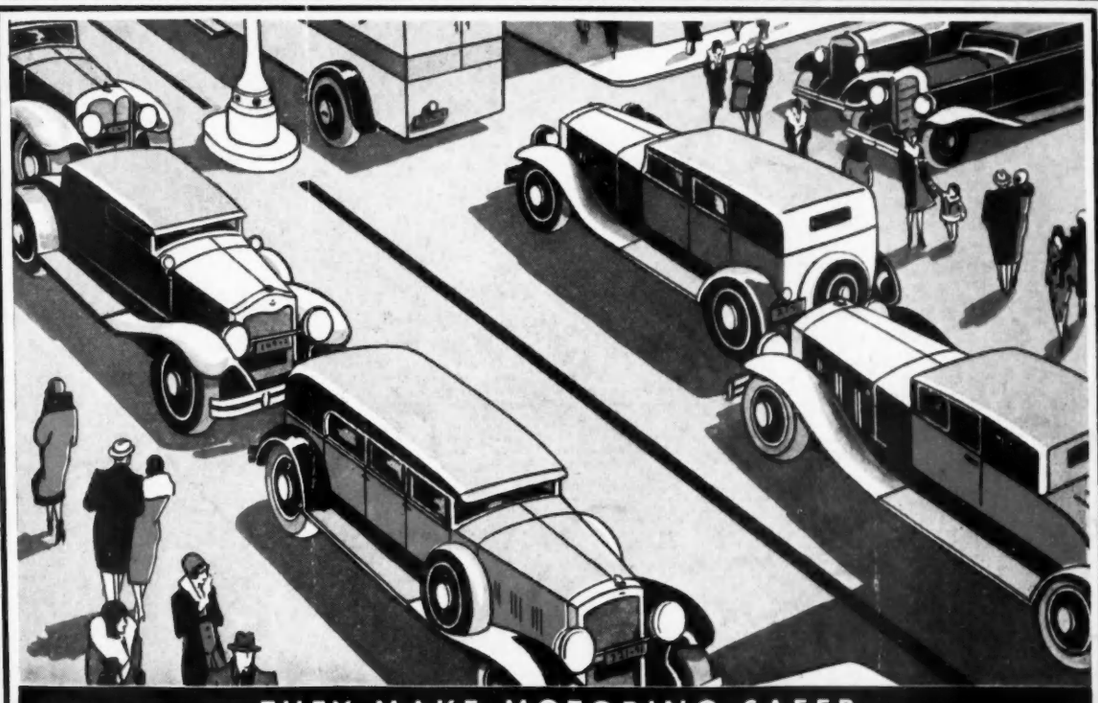

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**Published February 25th—Forms Close February 20th**

# AUTOMOTIVE INDUSTRIES
## The AUTOMOBILE

Volume 68 Number 6

Reg. U. S. Pat. Off.

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## Contents


Motors Give Rails Take. By Don Blanchard... 155
Engineers Still Not Ready to Say Yes on Doughnut Tires. By Athel F. Denham ..... 158
The Newest Ford a V-8. By W. K. Toboldt.... 160
Just Among Ourselves ..... 162
Tests Show How to Control Ignition Lag in Diesels ..... 166
Cents Worth of Fuel Does 100 lb. of Work. By J. B. Nealey.. ..... 163
Production Lines ..... 165
With New Thin-Walls Big End Liners Rods Can be Lighter ..... 169
Reaction Gives "Feel" to New Vacuum Brake .. 172
Book Reviews ..... 173
Automotive Oddities ..... 174
News of the Industry ..... 175
Calendar of Coming Events ..... 182
New Developments ..... 183
Advertisers' Index ..... 39



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Gear designs change, metallurgical advance introduces new alloys and more effective heat treatment. Gear tolerances are progressively less, both before and after hardening . . . . Through it all, one point remains fixed:

## THE GENERATING PRINCIPLE STANDS ALONE AS THE BASIS OF ACCURATE INVOLUTE GEAR PRODUCTION

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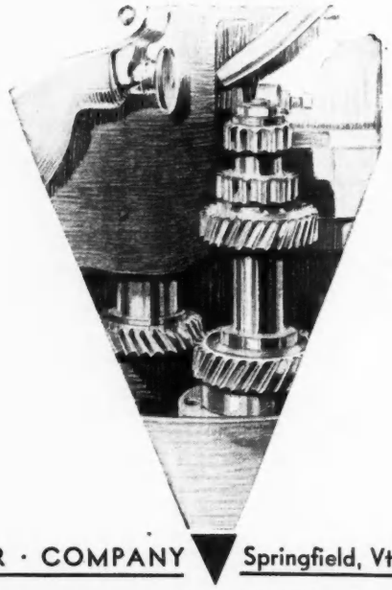

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METHODS

AUTOMOTIVE INDUSTRIES

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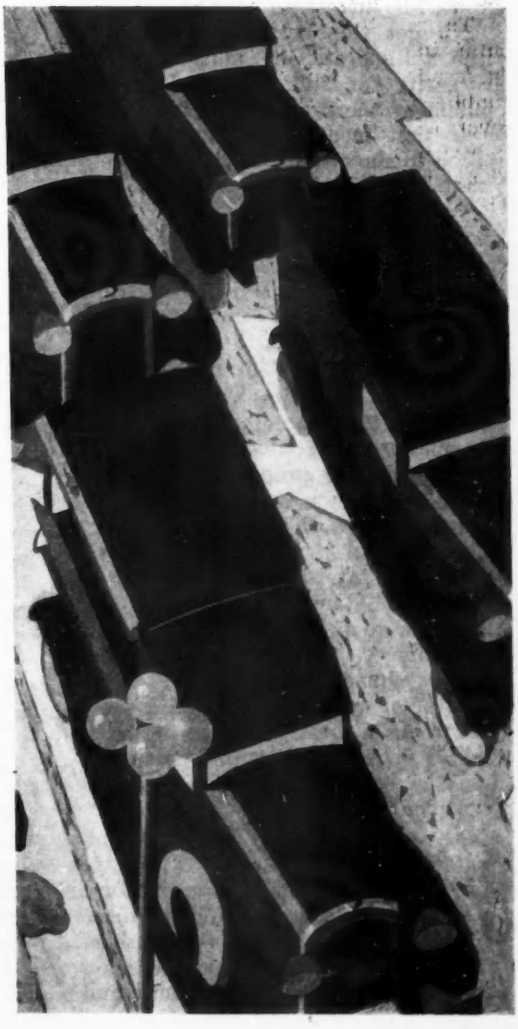
# Motors Give, Rails Take

## in Joint Report of Committee of Rail and Highway Users

By Don Blanchard

Editor, Automotive Industries



MANY of the recommendations made in the recent report on regulation and taxation of highway transportation by the Joint Committee of Railroads and Highway Users represent a real retreat from the traditional position of the manufacturers as well as of some other interested parties on the regulation of truck carriers. This traditional position was restated by the N.A.C.C. even so recently as Dec. 7 in its presentation to the National Transportation Committee of which the late Calvin Coolidge was chairman. At that time, the chamber said ". . . it does not appear that any detailed regulation of the common and contract carriers such as the railroads propose is now practical or desirable."

Yet, except in the case of rate regulation on which the Highway User element in the Joint Committee refused to concede that the railroad viewpoint was in the public interest, it is substantially such detailed regulation of truck carriers that the report proposes, particularly if the railroad interpretation is placed on all of its recommendations.

Detailed study of the report indicates that the railroads conceded little and demanded much, although the Joint Committee was supposed originally to be for the purpose of compromising divergent opinions. In the give-and-take of the committee's deliberations, the Highway Users appear to have done most of the giving and the railroads the lion's share of the taking.

Human beings, and that includes our local and national legislators, being prone to act on first impressions, it seems

likely that for most readers what is said in the report under the heading of "Statement of Principles" will constitute the report. Some of the principles included in the statement being subjected in the "Explanatory Notes" to divergent interpretations by the rail and highway groups on the committee, it is to be hoped that these notes will get the thoughtful consideration they deserve.

The report starts out by saying "The supreme test must always be the interest of the public. The public's right to the selection of the agency of transportation which it wants and which it finds most useful must be respected." And then proceeds to recommend a form of regulation for truck carriers which takes the right of selection out of the direct control of the public and vests it in a regulatory commission. Primarily responsible for the concessions made in this direction by the Highway Users was their desire to quicken experimentation in the field of truck regulation, presumably to settle the controversies which have raged on this subject for so long.

Under the plan of truck carrier regulation agreed upon by both elements in the Joint Committee, let's examine what a man would have to do to operate as a common carrier. First he would have to obtain a certificate of convenience or necessity from the Interstate Commerce Commission for interstate operation, or from the regulatory authority of his state for intrastate service.

To get this certificate permitting him to operate, he must show the necessity for and convenience to the public of the proposed service, whatever that means. He must be prepared to show that existing service of whatever kind is inadequate, or that it cannot be improved to meet public demands. Under such conditions why should anyone interest himself in discovering new opportunities for transportation service if some regulatory body is to hand over the fruits of his initiative to an existing agency?

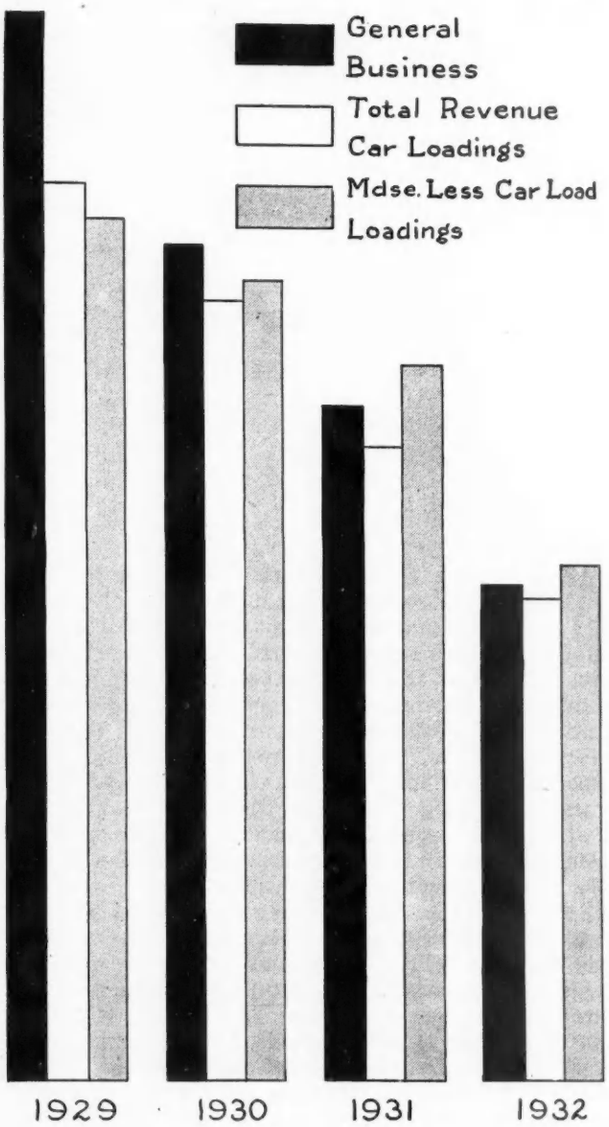
However, assuming that he is able to make this showing, if existing agencies contend that they will be damaged by the proposed service, the would-be common carrier may be required to show that no such damage will result or, if it will, that it is in the public interest. In addition to these regulatory requirements, the railroads would saddle him with rate regulation.

What chance has the single truck operator or even the owner of a small fleet to make these showings at a cost that is within the limitations of the earnings of the service he proposes to render?

The regulation proposed for the contract carrier would require him to secure a permit from the regulatory authority. In the granting of these permits, consideration would be given to the effect of the proposed operation upon highways and upon safety and convenience of the traveling public. The railroad interpretation of this language apparently would vest large discretionary powers in the regulatory authority. The interpretation of the Highway Users would make proof of financial responsibility the principal requirement, the issuance of the permit being mandatory when such proof is provided.

The railroads also would subject the contract carrier to minimum rate regulation. In this they are, of course, consistent. Regulation of common carrier rates will be difficult under the most favorable circumstances. But without control of minimum rates charged by contract carriers, such common carrier regulation would be impossible.

Although the Highway Users agreed to "certificate" regulation in the "Statement of Principles" section of the report, their real attitude on the subject apparently is more fully set down in the "Explanatory




Merchandise less-car revenue loadings, the freight classification which trucking probably affects most directly, have declined less than general business during the depression.

Notes" section in connection with the expression of their views on rate regulation. They are on firm ground here because they use the language of the Interstate Commerce Commission to express their opinions on both inter and intrastate service and there is no reason to suspect that the I.C.C. has any bias in favor of highway transportation. The quoted viewpoint of the I.C.C. follows:

"No person should be permitted to operate a motor vehicle for the transportation of property for hire, either as a common carrier or a contract carrier, over public highways in interstate commerce, without first having secured a permit.

"All motor carriers for hire should be required to apply to the Commission for a permit to operate and upon compliance with all the applicable provisions of the act should be entitled to such permit, which should be issued for a definite period, should be assignable with the approval of the Commission, and revocable by it for good cause shown.

"There should be required as prerequisites to the commencement of operations:

(1) if by common carriers, (a) a permit, and (b) liability insurance that will assure adequate protection for loss or damage to cargo and for personal injuries and property damage; and (2) if by contract carriers, (a) a permit, and (b) liability insurance to secure the public in case of personal injury or property damage.

"All motor carriers for hire should be required to keep such records of operations performed by them and make such reports as the commission may reasonably prescribe.

"There is substantially no demand for public regulation of the charges of motor trucks to protect shippers against exorbitant or discriminatory charges. The demand has been chiefly from the railroads, and for the prescription of minimum rather than maximum charges.

"Indications are that the number of motor truck operators is very large and that their operations are mostly on a small scale. Regulation which is appropriate and practicable in the case of a comparatively few large, well-organized companies may be quite impracticable in the case of a multitude of individuals or small concerns.

"A further consideration is that the Federal Government is wholly inexperienced in this field of regulation. Under these circumstances we deem it wise to make haste slowly . . . to be guided by the experiments which the states are making in this direction, and by its [the commission's] own experience in regulating the charges, practices and service of motor buses, if the latter regulation be established as we recommend."

This is a very different and vastly less restrictive form of regulation than the Joint Committee recommendations discussed earlier in this article and is in line with the traditional N.A.C.C. position on the subject.

The Joint Committee also failed to agree on the question of regulation of sizes and weights of all motor vehicles regardless of whether they are used in for-hire service or not. Here the rails took the stand that this was a subject for individual state regulation and against national standardization. The Highway Users, on the other hand, insisted on the recommendations adopted by the U. S. Bureau of Public Roads and the American Association of Highway Officials.

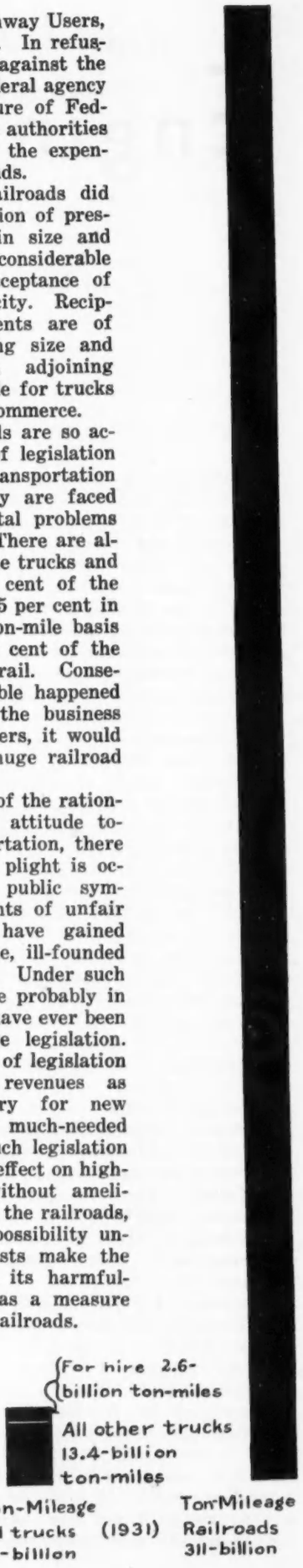
If there was one point on which the railroads might have accepted the viewpoint of the Highway Users, certainly it was this one. In refusing to do so, they went against the expert opinion of the Federal agency controlling the expenditure of Federal aid funds and of the authorities who are responsible for the expenditures of state road funds.

The fact that the railroads did hold out for a continuation of present chaotic conditions in size and weight regulation to a considerable extent vitiates their acceptance of the principle of reciprocity. Reciprocal licensing agreements are of little value if conflicting size and weight limitations in adjoining states make it impossible for trucks to move in interstate commerce.

Just why the railroads are so active in the promotion of legislation restricting highway transportation at this time when they are faced with so many more vital problems is difficult to explain. There are always going to be private trucks and they represent 85 per cent of the total. The remaining 15 per cent in for-hire service on a ton-mile basis handle less than 1 per cent of the traffic transported by rail. Consequently, if the impossible happened and the rails got all the business handled by motor carriers, it would be but a drop in the huge railroad transportation bucket.

However, regardless of the rationality of the railroads' attitude toward highway transportation, there is no doubt that their plight is occasioning widespread public sympathy. Their complaints of unfair highway competition have gained rather broad acceptance, ill-founded though they often are. Under such circumstances, they are probably in the best position they have ever been to put over restrictive legislation. This is especially true of legislation involving additional revenues as politicians are hungry for new schemes for getting much-needed cash. Even though such legislation may have a disastrous effect on highway transportation without ameliorating the position of the railroads, its passage is a real possibility unless automotive interests make the general public realize its harmfulness and its futility as a measure for the relief of the railroads.

**"Railroads would benefit in neither their volumes of traffic nor in their net earnings to any appreciable extent if all of the traffic that is moving by motor truck and motor bus on the public highways now were confined to their rails."**
**—National Highway Users Conference.**


For hire 2.6-billion ton-miles
All other trucks 13.4-billion ton-miles
Ton-Mileage All trucks (1931) 16-billion
Ton-Mileage Railroads 311-billion

# Engineers Still Not Ready to Say "Yes" on Doughnuts

## But low pressure tires are gaining favor as technical knowledge of the problems they create becomes greater

EVEN though nothing more extreme than triple oversizes is being considered now for original equipment, there are people who believe that "doughnut" tires are a panacea for all the ailments of a modern automobile, and there are also those who consider them an excellent means of spoiling a perfectly good car.

History is repeating itself. We are passing today through a period similar to that of 1923, when balloon tires first appeared in quantities. At that time tire companies were severely criticised because they merchandised "doughnut" tires first to the replacement trade, but in the light of subsequent developments it seems that this criticism was justified only insofar as the cars then built and running on the highways were not adapted to the use of low-pressure tires, and there was a tendency to go to extremes in recommendations of low pressures and large sections.

Similarly, last year sales departments brought pressure to bear on engineers to adapt cars to low-pressure tires, or vice versa; as in 1923, the engineering departments replied that the adaptation of these tires was an impossibility, and again as in 1923, the car engineers and the tire manufacturers finally arrived at a compromise.

Appearance is always a moot point among engineers, probably because no one has yet evolved a formula for predetermining the reaction of the customer. Indications are, however, that the majority of the driving public likes the looks of the larger section tires. It is also plain that appearance is becoming a more important factor in car merchandising.

When we come to "riding qualities," we are bothered by the lack of a definition of the term, which probably accounts for the many apparently contradictory experiences we hear about. I believe, however, that recent experience has definitely indicated that better overall riding qualities, by which term I include roadability, cannot be obtained by merely substituting the new tires for present equipment. A gain in one direction is likely to be offset by losses in others.

Experiences of different companies with low-pressure tires have been quite different even under apparently similar conditions. This seems to confirm the view that the successful adoption of these tires is dependent upon other chassis details. What will work on one car will not necessarily work on another. Before definite conclusions can be drawn more basic information is needed as to all of the variables that influence riding qualities. Moreover, the law of diminishing returns applies; the new tires can more readily be adapted to the smaller than to the larger cars, but even in the case of the former the gains which may be expected are not as great as those achieved when balloons replaced high-pressure tires.

Passenger-car engineers seem to be gradually changing their opinions with respect to the possible effect of the use of low-pressure tires on riding qualities. Questioned whether they thought that larger sections

In 1922 this was the tire in universal use

# "The Next Move is Definitely Up to the Car Manufacturer"

**Athel Denham says in this comprehensive summary of one of the most important controversies now raging among engineers.**

**He finds that engineering opinion on doughnut tires has veered considerably in the last six months and that engineers now are noticeably more receptive. In fact, moderate reductions in tire pressures are a not improbable development of the near future.**

**This important article will bring you up-to-date on this subject.**

by Athel F. Denham

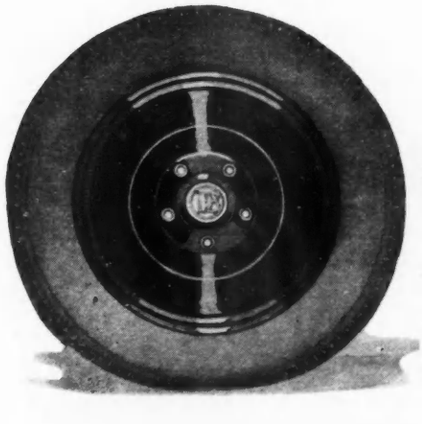
Field Editor, Automotive Industries

Digest of paper presented at S.A.E. Annual Meeting

than those now proposed might improve riding qualities, 44 per cent replied "no," 22 per cent, "perhaps," and 34 per cent, "yes." A year ago the vote would have been practically 100 per cent in the negative.

As regards traction, it seems to be generally accepted that the traction on gravel roads is better with low-pressure tires, while on ice the reverse holds. This latter view checks with the results obtained by Doctor Stinson at Ohio State University, who observed that the traction on ice decreases with the tire pressure, all other factors remaining the same. The majority feel that on smooth roads and in snow the traction is better with lower pressure. Doctor Lemon's tests with triple oversize tires indicated approximately 7 per cent greater adhesion, in deceleration tests on good roads, and he points out that as a result of this increased traction some of the wear and tear probably is transferred from the tires to other parts of the car.

Top speed seems to be reduced slightly, as is the acceleration, but the differences are small, especially as regards acceleration at low speeds. By overinflating the tires it seems to be possible to gain in speed over conventional tire equipment.



Above the super balloon of 1933 is illustrated

The lower pressure tires (left) made their early appearance in 1925

Increased maximum rates of acceleration and deceleration had been observed by less than half of the companies contacted. The greatest gains in this respect were made on gravel roads, which agrees with the observations with respect to the effect of low inflation pressures on road adhesion. Gains in maximum acceleration, however, are not sufficiently great to appreciably affect the torsional stresses on axle shafts. One company found that the maximum deceleration rate varied inversely as the tire size—the more oversizing the greater the distance to stop.

It is generally felt that with 15-in. wheels, 13 in. is the largest practical diameter for brake drums, which would indicate that the adoption of wheels of this size for the larger cars would necessitate the adoption of brake drums smaller in diameter and wider than those used at present.

Opinions differ as regards the effect of the larger tire sections on the tendency to skid. They seem to have no favorable effect on ice, but the majority feel that under other conditions, and especially on turns, cars with the low-pressure tires do not skid so easily. A point in favor of the larger tire in this connection is that in the event of a skid it would be more likely to climb a curb and thus prevent wheel breakage.

As to tire mileage, it is the consensus of opinion that with the recommended deflections the low-pressure tire will show only 80 to 85 per cent the life of that of the standard balloon. It is also believed that the mileage of the low-pressure tire is influenced more than that of the standard balloon by a change in the proportional deflection. It is therefore important that inflations be more closely maintained. It seems to be the general belief that if the inflation pressures of low-pressure tires were to be increased to a point that would assure the same tire mileage as obtained with standard balloons, most of the gain in riding qualities would be lost.

Changes in front-axle design and steering geometry seem to have overcome the occasional excessive tire wear experienced with the early experimental and field applications.

There seems to be a need now for an investigation of the relation between tread width and tire wear for the same tread pattern. One company has found

*(Turn to page 171, please)*

# The Newest FORD Eight—

## Bigger, Better Looking, Faster and More Powerful

By William K. Toboldt

A NEW 112-in. wheelbase Ford V-8 with much roomier bodies, entirely new and decidedly more attractive appearance, and more power than the former Model 18 V-8, is scheduled to make its debut this week-end.

Other important new features of the car, which is designated as the Model 40, are a stiff X-type frame, aluminum cylinder heads, higher compression ratio, straddle-mounted pinion shaft, four-pinion differential, and 17-in. wheels.

Prices, at the time of going to press (Feb. 9), are not available, but Ford dealers apparently expect them to be lower than on the Model 18. The smaller eight, which Ford is expected to bring out, apparently is still some weeks off.

Eight basic body styles are offered as follows: Roadster, phaeton, Tudor, three-window coupe, five-window coupe, Fordor, convertible cabriolet and victoria.

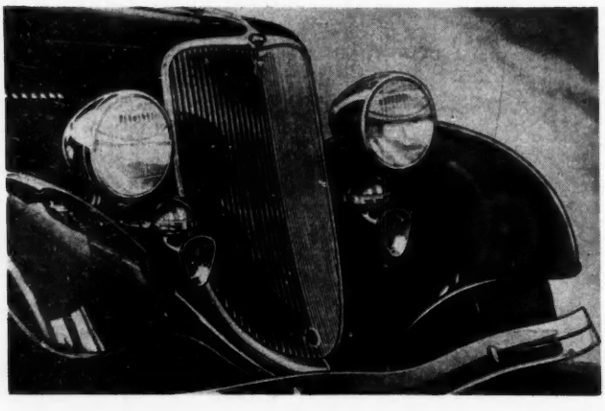
The engine now develops 75 hp. at 3800 r.p.m. against 65 hp. at 3400 in the former model. It is understood that the Tudor weighs about 2670 lb., which is equivalent to 35.6 lb. per horsepower. Maximum speed is reported to be 80 m.p.h.

Torque is now 148 lb.-ft. at 1200 r.p.m. as compared to 123 lb.-ft. at 1400 r.p.m. for the Model 18. Torque at lower engine speeds also is understood to have been increased, it being claimed that the new engine develops the same torque at 10 m.p.h. as the old did at 20 m.p.h.

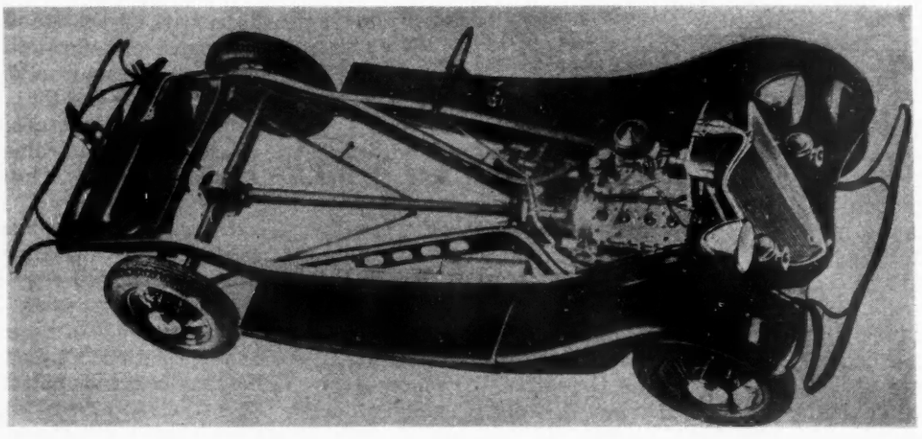
The new engine, while utilizing the same cylinder block as the former model and having the same bore and stroke (3 1/16 x 3¾ in.), has many detailed improvements designed to increase power. First of all, aluminum cylinder heads have been adopted which permit a compression ratio of 6.33 to 1 as compared to 5.5 to 1 on the original eight. Combustion chamber contour has been considerably altered from a sloping dome to a step-like contour, for increased turbulence. Compression pressure is now 138 lb. at 1800 r.p.m. as compared to 114 lb. at the same speed for the former model. The new head, incidentally, fits the Model 18.

While the manifolding, which encloses the V of the cylinder block, appears to be the same as on the former model, the Detroit Lubricator downdraft carburetor has been changed by increasing the diameter of the accelerator pump for ⅝ in. to 11/16 in. There has also been a reduction of .003 in. in diameter of the lower end of the metering pin.

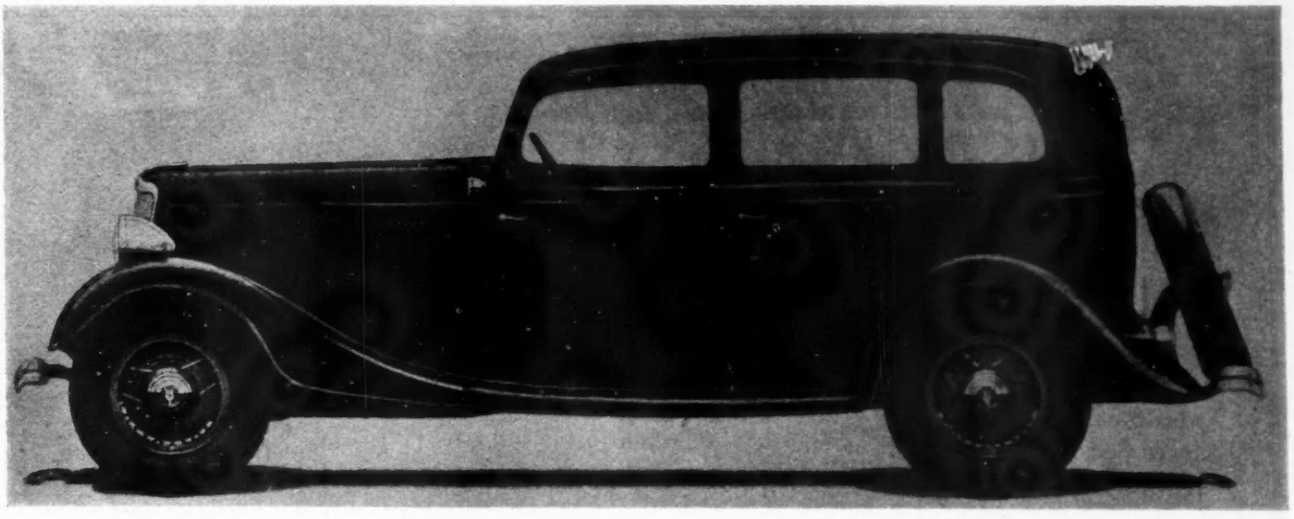
The ignition unit has also been altered in detail, but retains its characteristic design features. The coil



Above—The grille on the new Ford Eight is stainless steel.



Right—A stiff X-type frame is one of the important new mechanical features of the Model 40.



The deluxe Fordor on the new 112-in. wheelbase, V-8 chassis.

is now of the closed-circuit core type with the primary winding next to the core. A thumb screw adjustment is provided for the vacuum advance unit, and the centrifugal advance mechanism has been altered to provide a more gradual spark advance. Spark plugs are of the 18-millimeter type.

Together with the stronger mounting for the generator, the fan is now mounted at a point higher than on the former model so as to improve cooling. There are no changes in the starting unit.

Crankshaft, connecting rods, engine bearings, pistons and rings are unchanged. The use of the cast aluminum oil pan has been discontinued, instead a steel stamping is utilized.

The frame has been considerably strengthened by the adoption of an X-type cross-member. The design is such, that the rear legs of the cross-member are extended in the chassis side rails to a point about 10 in. from the rear of the frame, while the forward legs extend to within about 3 in. from the front end of the chassis side rails. At the center of the X, the two side members are joined by a box-type section, which curves down at the center, to form a support for the engine rear mounting. The chassis side rails are 6 in. deep, with 1¾-in. flanges and made of .10-in. stock. The X-member is of similar stock and is stamped out for lightness.

In addition to the X-type cross-member, the frame is braced by a tubular member behind the rear-mounted fuel tank, a channel member immediately in front of the fuel tank and another channel member at the front of the frame.

At the front, the engine is mounted on two rubber "biscuits," while at the rear, the design has been changed to a trunnion-type mounting. This latter support is immediately behind the transmission and rests on the box-section member that joins the two sides of the X-member together.

There are no changes in the transmission. However, leaf springs are now placed between the friction facings on the clutch plate for smoother engagement.

The design of the three-quarter floating rear axle has been considerably improved. The drive pinion is now straddle-mounted, the outboard bearing being of the solid straight roller type. The other two bearings on the pinion shaft are taper roller bearings. The differential is of the four-pinion type instead of three, and the large reduction gear instead of being of the conventional ring design forms a plate to which the differential carrier is bolted.

The final reduction is 4.11 to 1, the same as on the former model. Tire size has been changed from 5.25/18 to 5.50/17. The welded steel spoke, one-piece design wheels are continued.

In addition to the stronger frame, the stiffness of the car as a whole has been increased by the construction of the body with its steel underpan, which extends forward beyond the transmission. The center of this pan is recessed at the center to provide clearance for the torque tube. There is also an opening at the center of the rear seat for clearanec of the rear axle housing.

In addition to the longer wheelbase and larger tire section, riding qualities should be influenced by improvements in the chassis springs. These are of the cross type, as heretofore, but the ends of the spring leaves are turned up slightly. In addition, the Houde two-way shock absorbers are now placed within the channel of the side rail and in such a position that they afford better control over rebound.

The braking system, with its mechanically operated two-shoe brakes and characteristically short brake cross shaft is continued from the previous model. The brake cross shaft is now directly behind the center of the X-cross member and is supported thereby.

Returning to the body of the car, appearance can be, of course, best judged from the illustrations. However in this connection it might be pointed out that the angle of the radiator grille (a rustless steel stamping) coincides with that of the windshield and the rear line of the hood and the forward edge of the door.

The hood is carried well back over the cowl, with a space at the top center for a cowl ventilator. The hood louvers are attractive, the line formed by the lower edges of the louvers conforming to the curve of the front fenders. Fenders are of modern design, with side skirts and the construction eliminates the use of the conventional front splash apron. Side splashers have also been eliminated, the lower edge of the doors being only an inch or so above the running boards. At the rear of the body, appearance has been im-

*(Turn to page 184, please)*

# JUST AMONG OURSELVES

## Trans-Ocean Flight Makes Page 6

JEAN MERMOZ, French mail pilot, flew the Atlantic Ocean in a 16-hour non-stop flight, leaving from French West Africa and landing in Brazil on January 16th, 1933. He flew a tri-motored plane and carried five men with him.

His feat made page 6 of the New York *Herald Tribune* on Jan. 17th.

Inauguration of electric train service between New York and Philadelphia made page 3.

How does evaluation of transportation news change with the years! Ten brief years ago, transatlantic flights were still "streamer head" first page news.

* * *

## Poorer But More Comfortable

THE outstanding engineering developments in passenger cars since 1929, we got to thinking the other day, can almost all be listed under increased comfort; greater ease of control; or better "performance."

And suddenly, it seemed strange that these particular things should have been dominant in the years of our greatest economic depression. A student not close to the industry itself might have expected that designers would have been found emphasizing economy of operation, transportation utility and absolute minimum of first cost in a period which was featured by vast wage slashes, increasing unemployment and widespread reduction in every family budget.

True, one can buy more automobile for his dollar today than ever before, but, economically speaking, we have not had until right now automobiles—individual transportation—made available in distinctly lower price classes than were available at the beginning of the depression.

And certainly no major emphasis has been placed on economy of operation, although general improvements along this line have been made.

It is clear, in other words, that automotive designers have sought to turn back the depression with major emphasis on items of comfort, ease of control and "performance," elements which the economist normally would associate with periods of rising markets and general prosperity.

The depression hasn't been turned back. That doesn't mean, obviously, that it could have been turned back if economy or other factors had been emphasized in design instead of comfort, ease of control and performance. The engineering emphasis might have been entirely different and the sales result have turned out to be just the same—or worse. But the concurrence of emphasis on luxury design features during a period of economic depression seems unusual enough to warrant some thought.

* * *

## Price War Armistice

HERE we are nearly up to the middle of February and car prices haven't done any gymnastics, a fact which will delight the heart of nearly every parts company executive as well as that of competing vehicle makers.

There wasn't any real chance of price moves this year until the first of February, but some informal trepidation existed as to what might happen immediately thereafter. Everybody knew that prices couldn't be cut any more if any faint hope of profit was to remain and everybody hoped that everybody else would be sensible enough to continue along at levels established as the year began. And now it looks as though just that thing would happen—which is all to the good. A price war at this time could help nobody and would wound nearly everyone—perhaps mortally.

* * *

## Pictures Don't Show Some Curves

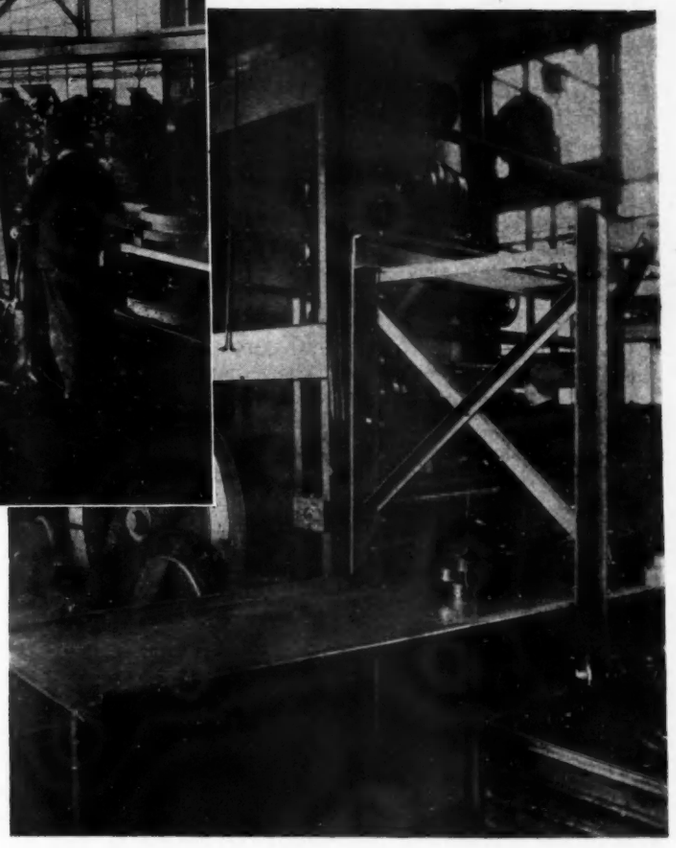
STREAMLINING tendency, with its plethora of new curves and contours, has brought new problems for the photographer and artist who would convey to those who have not seen the 1933 creations, just exactly what they look like.

Look over the pictures of the new models published in the last couple of weeks and then see the cars themselves and you will understand what we mean.

Always there is this difference in impressions between the pictured and the actual so far as automobiles are concerned. But this year, we think, it's more pronounced than ever.

Since the problem will become greater, rather than less, advertising departments probably will be puzzling over it for some time to come. (Although the photographs flatter in a few instances, we think.)—N.G.S.

Final assembly line with japan and brake lining ovens in the background



Discharge end of the japanning oven where parts are cooled and then unloaded for the assembly line

# Cent's Worth of Fuel Does 100 lb. of Work

## in the japanning department of the Midland Steel Products Co. at Detroit

by J. B. Nealey
American Gas Assoc.

GROUPING all of the mechanical units contributing to the manufacture of a product along a continually traveling conveyor is the goal sought in mass production, and when the heating processes can be mechanized and synchronized with the rest of the line there is small room for improvement. Such a grouping has been set up in the Detroit Pressed Steel Division of the Midland Steel Products Company at Detroit, Mich., for the making of parts and assemblies of "Midland Steeldraulic Automobile Brakes."

In this plant a large jobbing business in medium and heavy stampings for all industries is carried on and many parts for the automotive industry, such as assembled chassis frames and chassis frame parts, brake backing plates, front engine covers, fender brackets, etc., are produced. The first unit on the brake assembly line is a combination washing machine, japan dip and bake oven served by a single traveling conveyor consisting of two chains, suspended between sprockets, which support 8-ft. bars between them. The work is hung on these bars and is taken

through the seven operations without interruption. These include washing, drying, cooling, dipping, draining, baking and cooling.

The washing machine consists of a tank of water, heated with gas burners, overhead spray and a pump, the hot water being forced onto the work through high-pressure jets. The water in the 1800-gal. tank is heated with an immersed coil, one end of which is welded into one end of the tank, and into which the gas burner fires. The water is carried at 150 deg. F. The burner is of the premix type, gas and air being intimately mixed in a motor-driven blower before being forced through the burner.

The conveyor travels through the washer horizontally, but immediately thereafter changes direction for two passes vertically in the dryer, which is heated to 400 deg. F. with a single gas burner, with temperature control similar to those described later. The work exits from this to the cooling section through an air-locked opening and, after a cooling pass, descends into the V-shaped tank containing the japan and back up over the drain board into the bake oven through another air-locked opening. In this oven, which is only 17 ft. long, the conveyor makes seven vertical passes between sprockets, giving it a total travel of 90 ft.

Heat is supplied by a separate gas-fired heater consisting of a well insulated double steel jacketed shell, cylindrical in shape, and with a single gas burner set in one end. Recirculation is employed in this heating system, a motorized fan and duct at the other end of the heater drawing the heated air from the oven and forcing it into the heater, where it is reheated and passed back into the oven through another duct in the heater shell, closer to the burner end. Of course, some fresh air is needed, and this is taken in through a dampered port in the first duct. The proportions of this fresh air varies considerably with the type of japan employed, but the smaller the volume used the greater the economy of the oven. The volume of hot air required to fill the oven is recirculated about five times a minute. The surplus air, equal to the amount of fresh air inducted, is exhausted to the atmosphere through a stack. Steam from the washer and fumes from the dipping compartment are exhausted through a duct serving both and by an induction fan with motor.

Fire-quenching liquids and gas, with sprays in the tank and $CO_2$ gas in the oven, are interconnected with automatic devices, which release them in case of fire, while, at the same time, the japan in the 450-gal. dip tank is automatically drained off into an underground reservoir. The burner is supplied with a gas pilot.

As the work comes out of the oven it is given three vertical passes on the conveyor, the first two for cooling and the latter bringing it into a convenient position for unloading. The conveyor then turns at right angles at the top of the pass and travels over the oven and washer back to the point of beginning. This conveyor is driven with a two-hp. motor through a spur gear reducer and variable speed transmission, and an on-and-off push button control is provided at both ends of the oven. The motor, transmission equipment, sprockets, chains and other parts of the conveyor are supported on structural steel work with expansion allowance and tracks.

A 25-day test, in which 1,443,300 lb. of work was processed, showed a fuel consumption of but 210,000 cu. ft., which was purchased at the rate of about 68 cents per thousand cu. ft. This reduces to one cu. ft. of gas for every 6.85 lb. of work, or a fuel cost of one cent for 100 lb. of work.

## Diesel Research in Russia

ACCORDING to a report made at the annual meeting of the German Society of Engineers, there exists in Russia a research institute for Diesel engine design and also a Diesel Association. A periodical for Diesel engineering has been established recently and the problems involved in the design and manufacture of Diesel engines of all sizes are to be studied intensely. The research institute is said to have a staff of two hundred, of which about one hundred are occupied with purely scientific problems. At the present time the production capacity of the Russian Diesel engine industry is said to be 280,000 hp. per year, while the demand is for about 2,000,000 hp. annually.

Among the problems to be dealth with by the research organization the following are mentioned:

1. Development of Russian types of Diesel engines with view to utilizing a given number of parts for the greatest number of purposes.
2. Introduction of Diesel engines in new fields.
3. Conversion of the engines for the use of fuels that are plentiful in the U.S.S.R., such as peat, shale oil, wood, sawdust and agricultural wastes, for which reason gas generators and gas engines are also to be included.

The Scientific Research Institute is equipped with Diesel engines of different types installed in four large rooms. The institute is divided into six sections, viz., thermodynamic, marine and stationary, high-speed Diesel, fuel research, industrial-technological research, and standardization and literary section.

Among other work the Institute has designed as experimental locomotive Diesel engine and tested it. The fuel section has delved into the problem of shale gasoline and the development of generators for oily shales.

At the present time the Diesel industry in Russia is not very far advanced and operates chiefly under licenses from foreign manufacturers, and the research and development work now scheduled is intended to change this situation.

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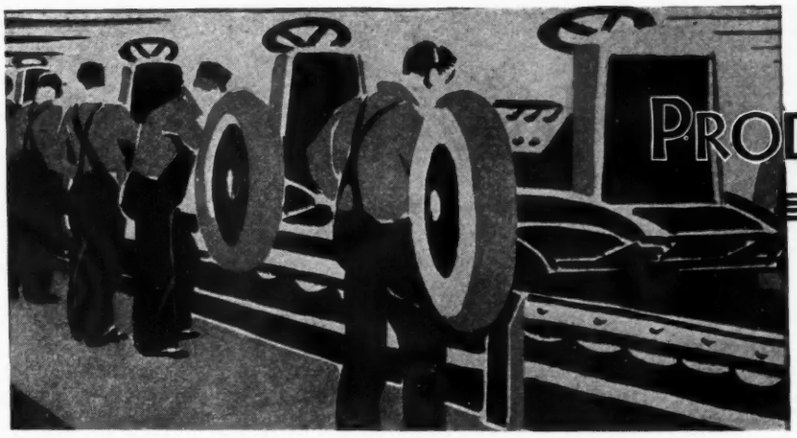
## Municipal Auto Loans

IN Paris the auto-loan business is in the hands of the municipality, and persons raising loans are required to leave their cars with the department of the city government concerned, the Mont-de-Piété. When the system of giving loans on automobiles was first instituted, in 1911, it was considered by some people an excellent plan whereby they could get free winter storage for their cars, but there cannot have been many such, for until recently the premises on which the cars were stored could accommodate only 150. But times have changed and the demands made by motorists upon "Ma Tante" (My Aunt), as the institution is popularly known, have increased greatly. The directors of the institution, moreover, seem to think that the auto-loan business has a great future, for they have just erected in Paris what is considered the largest dead-storage garage in Europe. It has eight floors, two of them below ground, and has no ramps, as they would take up too much room in a building where cars are stored for safe-keeping over longer periods. Some doubt has been expressed, however, whether when times change for the better again the Mont-de-Piété will do enough auto-loans business to pay interest on the 20,000,000 franc investment represented by the new building.



# PRODUCTION LINES

## Machine Tool Executives Consider Mutual Questions at the Industrial Marketing Conference of the A.M.A.

### Selling Formula

"Buy now to step up production" has changed for the time to "buy to reduce cost," according to H. F. Bailey, president, Rotor Air Tool. The selling of manufacturing equipment should visualize in facts and figures the opportunity to cut production costs at the present volume of activity.

### Up to the Top

Mr. Bailey also stressed the need of broadening sales activity to include the higher company officials such as the treasurer and chief executive as well as the factory executives. This demands the use of some form of net profit statement that is simple, sound, and tells the story of savings in the language of the people who control the purse strings.

### Adjusting Prices

The relation between the price of machine tools and the volume of sales in the machine tool industry was one of the points made by H. S. Beal, J. & L. manager. Since tools are bought as capital investment to make possible manufacturing economies, it is apparent that their price establishes the volume of business which will be available.

### Price Platform

Thus, Mr. Beal makes the following suggestions: that one price policy is most effective and should be preserved; that equipment prices should be varied according to the current value of the dollar, higher in booms, lower in depression; also that reductions in price should be made public in price lists rather than by special concessions.

### Free Service?

The role of service in selling machine tools, which was discussed so thoroughly in *Automotive Industries* last year, was approached from a different angle by J. H. Macleod. He feels that the trend toward free service is spreading. And is working well where the problem is freely and frankly dealt with. For example, in some cases the buyer agrees to pay for the service if he places his order elsewhere. In Mr. Macleod's own company, the Hinde & Dauch Paper Co., there is a tacit understanding between the salesman and the customer that the company will be given the business for at least a year, at its price, if the design is accepted.

### Charge It

Mr. Macleod leans favorably to the idea proposed at last year's A.M.A. conference that the service charge should appear as a separate item on the invoice, marked "no charge." This is a good means of acquainting both the seller and the buyer with the cost of free service. And will enable the salesman to demonstrate the reasonableness of charging for the service if its cost becomes excessive.

### Sales Management

Fred. Heitkamp of Cincinnati Milling took as his theme the problems of industrial sales management under present conditions. And it's a trying situation, you must agree, after you read his paper. Courage, resourcefulness, hope, vision, and a lot of other things are needed to navigate the ship on its present course.

### Cutting Stampings

Met a schoolmate of ours who is getting along by showing how you can cut the cost of making stampings in small lots. Anyone making stampings in small lots to supply salesmen's samples or for experimental runs should be interested. It is called "The Continental Small Lot Stamping Process." They will make stampings to order within 48 hours or will license you to make your own with the method. The short-cut process can be used with any material, of any size, any shape, that can be produced on a 300-ton press.

### Sober Reflection

F. A. Merrick, president, W. E. & Mfg. Co., indicts the mechanism of barter and trade in his New Year's statement to the stockholders. It's not the advance of technological improvements that we should be concerned about. Rather it is the fact that political economy is an art which has not kept pace with the sciences. In this thesis Mr. Merrick is supported by many clear thinkers in high places. As more thought and action is expended in this direction, we may approach a more stable civilization.

### Applications in Industry

From modest beginnings, stainless and rustless steels have developed a wide field of usefulness. Some idea of their place as a decorative medium as well as an engineering material may be gained from a recent publication by the Electro Metallurgical Company. It's a profusely illustrated booklet, "Stainless Steels and Their Uses."

—J. G.

MANUFACTURING MANAGEMENT METALLURGY

# Tests Show How to Control

AN investigation bearing on the effects of fuel quantity, injection advance angle, injection valve-opening pressure, air-inlet pressure, compression ratio and engine speed on the ignition lag was completed recently at Langley Memorial Laboratory and is reported in Technical Note No. 434 of the National Advisory Committee for Aeronautics, "Influence of Several Factors on Ignition Lag in a Compression-Ignition Engine," by Harold C. Gerrish and Fred Voss.

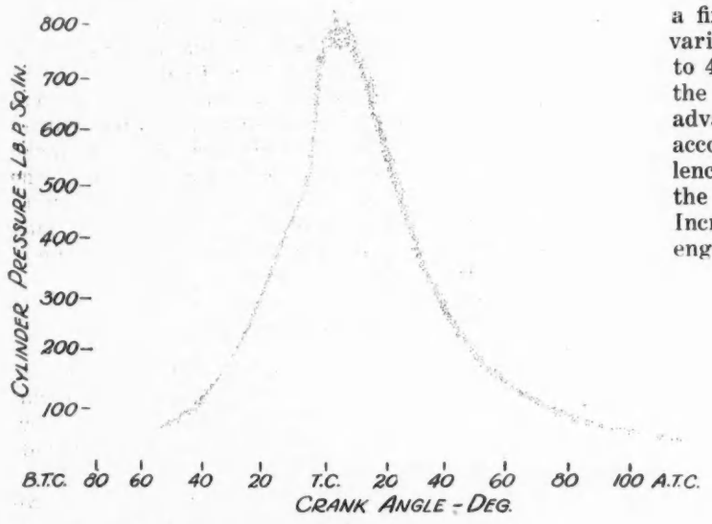



Fig. 1—Indicator diagram taken from experimental engine with modified Farnboro indicator

The tests were made with a single-cylinder engine, in connecton with which there were used three cam-operated fuel-injection pumps, two pump cams and an automatic injecton valve with two different nozzles. Ignition lag for the purpose of this investigation was defined as the interval between the start of fuel injection (as determined by means of a Stroborama) and the start of effective combustion as determined from an indicator diagram, the latter being the point where $4.1 \times 10^{-6}$ lb. of fuel had been effectively burned.

It was found that with this particular engine, with a fixed start and a constant rate of fuel injection, a variation in the quantity of fuel injected from $1.2 \times 10^{-6}$ to $4.1 \times 10^{-6}$ lb. per cycle had no appreciable effect on the ignition lag. A certain change in the injection-advance angle will increase or decrease the ignition lag according to whether density, temperature or turbulence has the controlling influence. An increase in the valve-opening pressure slightly increases the lag. Increases in inlet air pressure, compression ratio and engine speed reduce the lag.

Ignition lag has an important influence on the smoothness of combustion, because if the lag is great, a considerable amount of fuel will have been injected when ignition occurs, and all or most of this fuel will then burn at once, causing a very rapid pressure rise. If ignition took place immediately the injection started, the rate of combustion could be controlled by the rate of injection.

It has been shown recently that the chem-

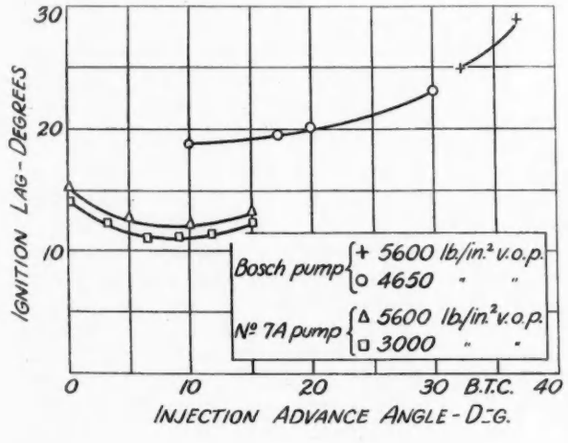



Fig. 2—Effect of injection-advance angle and valve-opening pressure on ignition lag

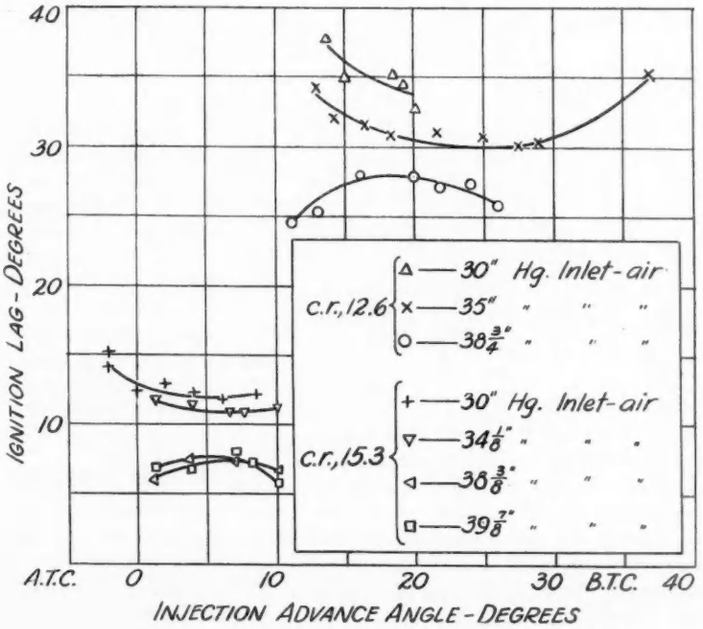

IGNITION LAG - DEGREES
40
30
20
10
A.T.C. 0 10 20 30 B.T.C. 40
INJECTION ADVANCE ANGLE - DEGREES
C.R., 12.6
Δ — 30" Hg. Inlet-air
× — 35" " " "
o — 38 3/4" " " "
C.R., 15.3
+ — 30" Hg. Inlet-air
▽ — 34 1/8" " " "
◁ — 36 3/8" " " "
□ — 39 7/8" " " "

Fig. 3—(Right) effect of injection-advance angle and inlet pressure on ignition lag

# Ignition Lag in Diesels

## N.A.C.A. Studies Show Lag Reduced By Increases in Inlet Pressures, Compression and Engine Revolutions

ical characteristics of the fuel have a greater influence on the ignition lag than any of the physical proportions, but the lag can be influenced by mechanical and thermal means.

Tests were carried out on the N.A.C.A. single-cylinder universal test engine, in which the inlet and exhaust valves are arranged horizontally in the head, opposite each other. Three different spacer rings were used between cylinder and head to obtain different compression ratios. The three fuel-injection pumps used were the Bosch, the N.A.C.A. No. 7, and the N.A.C.A. No. 7A. The two automatic injection valves used both produced a fan-shaped spray coincident with the largest section of the combustion chamber; both had six orifices, the aggregate area of which was 0.00072 sq. in. in one case and 0.00079 sq. in. in the other. The nozzle having the smaller area was used in tests with compression ratios of 12.6 and 14.8, the other with a compression ratio of 15.3.

The fuel used was a commercial grade of Diesel fuel oil having a specific gravity of 0.847 and a Saybolt universal viscosity of 41 sec. at 80 deg. F.

Variable inlet pressures were obtained by means of a 4-in. Roots type supercharger with pulsation-damping tank.

Fig. 1 shows an engine indicator diagram taken with a modified Farnboro engine indicator. By means of a method worked out at the Langley laboratory ( which is to be described in a special report on the analysis of indicator diagrams) the amount of fuel burned at any point of the cycle was determined, and, as already stated, the point where $4 \times 10^{-6}$ lb. was burned was taken as the beginning of effective combustion. It is realized that by using this definition of ignition lag, somewhat larger values are obtained than when ignition lag is considered to be the time elapsed between the start of injecton and the very start of combustion; however, owing to the small amount of fuel that is being burned during the delay period and to the composite indicator diagram being analyzed, it is difficult to obtain definite trends by considering the start of combustion to occur when smaller quantities of fuel are burned.

It has already been pointed out that the quantity of fuel injected did not have any effect on the ignition lag if the beginning and rate of injecton were constant.

Figs. 2 and 3 show the effect of injection-advance angle on the ignition lag. It will be noted that the curves in Fig. 2 and all those in Fig. 3 for inlet pressures of less than 38 in. of mercury are concave upward, while above this pressure the curves are concave downward. The reversal in trend of the curves is apparently independent of the compression ratio, and the variation in ignition lag shown by the figures is thought to be due to com-

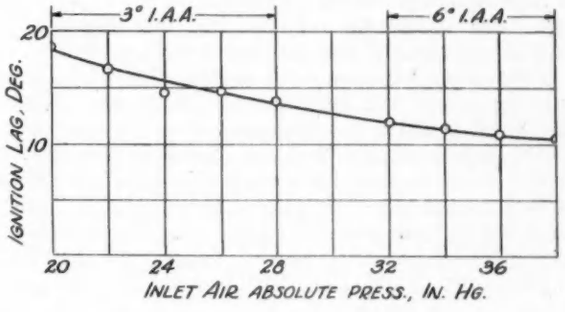



Fig. 4—Effect of inlet air pressure on ignition lag

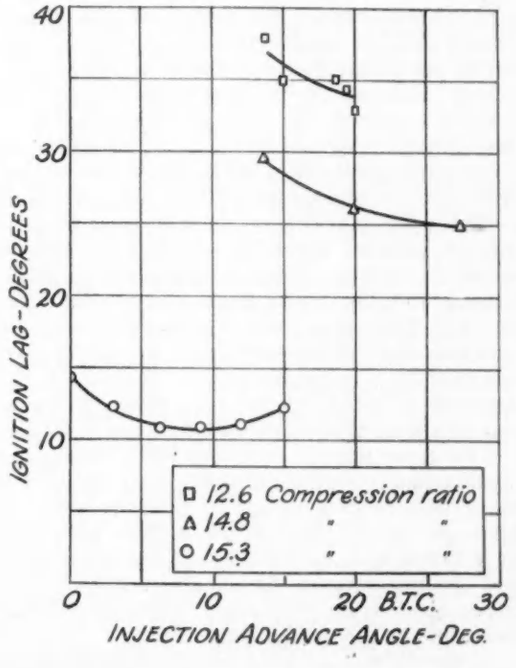



Fig. 5—Effect of compression ratio on ignition lag

binations of the effects of density, turbulence and temperature of the air. Neumann found that as the difference between the air temperature and the ignition temperature of the fuel—which decreases with density—increases, the ignition lag decreases, and it also decreases with an increase in turbulence. Dicksee found the ignition lag to decrease with an increase in the injection-advance angle from 0 deg. to 12.5 deg. in one engine, but in another with a more orderly air flow the lag increased with an increase in the injection-advance angle from 15 deg. to 24 deg.

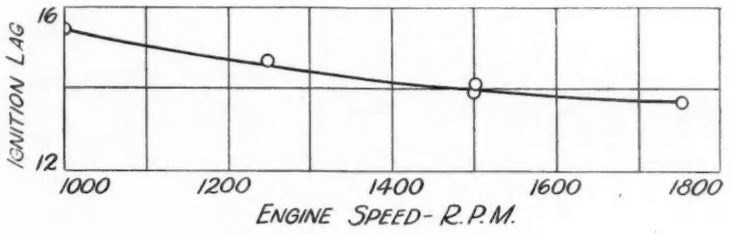



Fig. 6—Effect of Engine speed on ignition lag

Fig. 2 also shows that an increase in the valve-opening pressure results in a slight increase in lag. An increase in the valve-opening pressure increases the rate of injection and the fineness and uniformity of atomization of the spray. An increase in the rate of injection tends to increase the lag because there is more fuel present in the cylinder throughout the lag period, and more heat for its vaporization is therefore withdrawn from the air. A decrease in drop size should decrease the lag, because less time would be required by the smaller liquid particles to attain the ignition temperature.

From Fig. 3 it may seem that as the inlet air pressure increases the ignition lag decreases. The decrease in ignition in this case was not due entirely to the increased air pressure, however, because precompression increased the temperature of the air from 80 deg. to 125 deg. F. Fig. 4 shows that the ignition lag varies substantially linearly with the inlet air pressure, a result which confirms observations of Mucklow to the effect that the lag increases linearly as the inlet air pressure is reduced below atmospheric.

Fig. 5 shows the effect of the compression ratio on the ignition lag. It will be seen that the lag is reduced by increasing the compression ratio. The main reason for this probably is that at high compressions there is a greater difference between the temperature of the compressed air at ignition and the ignition temperature of the fuel.

An increase in engine speed from 1000 to 1750 r.p.m. decreased the ignition lag, as shown by Fig. 6. This is due to the combined effects of air temperature, turbulence and initial rate of injection. The first two factors increase with engine speed and reduce ignition lag, whereas the latter, which also increases with engine speed, increases the lag.

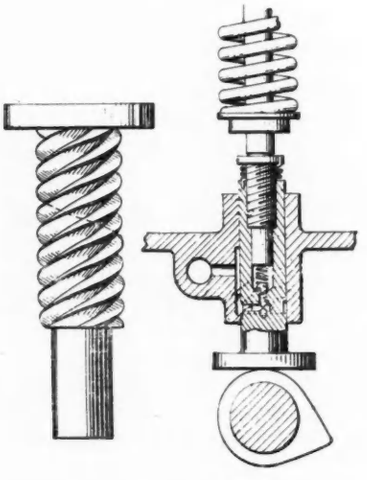
# Automatic Valve Adjuster

AN improved type of automatic valve adjuster has been invented by Robert W. McDonogh of Altoona, Pa. It appears that one difficulty encountered when such adjusters were applied to L-head engines, where the tappet is supported directly on an oil cushion, is that the high pressure on the oil at the moment the valve is being lifted from its seat is apt to cause considerable leakage past the plunger. This difficulty the McDonogh lifter is designed to overcome.

The valve plunger, as may be seen from the drawing reproduced herewith, consists of two parts, the upper part being provided with a coarse pitch exterior thread and the lower with a corresponding interior thread. The upper part is screwed into the lower part and the protruding portion of the upper part is surrounded by a coiled spring in torsion, which tends to unscrew it from the lower part, thus tending to take up any clearance that may develop in the valve mechanism.

The upper part of the valve lifter below its threaded section has a smooth cylindrical portion which is located in a corresponding bore in the lower part. Oil from the lubricating system of the engine enters this bore through a ball check valve at the bottom of it, and the pressure of the oil also tends to unscrew the upper part from the lower, thereby taking up the clearance in the mechanism.

In operation, the upper part is virtually dealt a quick succession of blows by the valve stem, which tends to force it further into the lower part, thereby producing an increase in the pressure on the oil trapped in the lower part. It is obvious that as a result of the thread on the upper part, the increase in pressure on the oil during a valve lift will be less than if the upper part were in the form of a smooth plunger supported by the oil alone. With less pressure on the oil there should be less leakage.



The right hand view shows the tappet assembly and the left hand view a detail of the coarse-threaded member

## With New Thin-Wall Big End Liners

# Rods Can Be Lighter

### As Less Rigidity Is Needed With Replaceable Bearings

DURING the past year or so, "thin-wall" steel-backed, babbitt-lined main bearings for automobile and truck and bus engines have made rapid headway as original equipment. Now a similar development is taking place in the connecting rod field. Among the 1933 cars having this type of rod bearings are the Willys, Stutz, Oldsmobile and the Chrysler group. Previous to this they had been introduced first in the Chrysler Z-1 bus and marine and truck engine, then in the Chrysler CP or eight. They are also to be found in the Stutz which has an aluminum rod and steel cap, the Franklins, with all-aluminum rods, the Nash 6 and smaller 8 with steel rods and aluminum caps and the Nash larger eights with aluminum rod and steel caps. Further they have been used to date in Diesel engines with aluminum rods and bearings up to six inches in diameter.

The replaceable liner which is to be found in these models consists of a thin-wall (defined as "manually flexible") steel-backed bearing in two half-shells lined with a thin coating of babbitt. They are manufactured to be completely interchangeable, not only in themselves, but by accurate machining of the lower ends of the rods, also in rods in service, without fitting.

As produced by the Cleveland Graphite Bronze Co., they are manufactured from strip steel, babbitted in the flat form, cut to approximate length, then formed to shape in presses, and finally machined inside and out to tolerances of .00025 in. Being flexible the bearings are claimed to be self-seating under the pressure made available by drawing up the connecting rod bolts. Generally they are shaped in such a manner that the ends are slightly compressed inward in assembly, to further assure a good seat at the parting line.

## Replacement is Simple

Oil grooves and holes are machined in the bearings, so that in service a "burned out" rod can be replaced merely by dropping the lower pan, loosening the connecting rod bolts, removing the cap, sliding the rod up slightly, inserting two new bearing halves, and reassembling the cap and the crankpan.

Actual tolerances for the thickness of the bearing run in the neighborhood of .00025 in. (one-fourth of a thousand), all on the plus side, with no minus, except that the bearings are sometimes relieved, and hence the wall thickness reduced, for short distances adjacent to the parting line edges.

It will be seen therefore, that accuracy of interchangeability of the bearings is easily obtainable, providing the rods themselves are held to sufficiently close tolerances. Several methods for finishing the big end bores to close tolerances have been developed, and include the possibilities of broaching, grinding, diamond boring and machining.

Another use for the bearings has been already found, and that is for replacement in rods which were previously babbitted. At least one motor vehicle manufacturer rebores all his returned service rods and fits them with the new liners in place of rebabbitting the rods.

This development has been made possible by the relatively thin section or thickness of the liners, in turn made possible by the relatively high modulus of elasticity of the backing material—in this case steel.

Some rather interesting side-lights on design have been thrown by experiments in connection with these bearings. It was found for instance, it is stated by the manufacturers, that the liners permit a radical departure in connecting rod practice. Where formerly the desire was to obtain maximum rigidity with the minimum of weight, for longest life of babbitted rods, flexibility rather than rigidity has been found most helpful with the new liners. This might result in a considerable lightening of connecting rods, one engineer feeling that it is quite possible that in the future steel rods may be designed weighing no more than present-day aluminum rods.

In the engine design field, the liners may also prove a means of avoiding the necessity of crankshaft redesign in connection with further power increases. One of the reasons for the popularity of the thin wall main bearing has been that it permitted an increase in the crankshaft main bearing diameter without other changes in the engine, especially when taken in conjunction with the adoption of counterbalances for relieving main bearing loads. Crankpins, however, were still limited in diameter by other design considerations.

Adoption of the thin wall connecting rod liner might easily in some cases save a new crankshaft or crankcase design by permitting an increase in crankpin diameter.

When the liners were first projected and offered to the industry engineers offered numerous objections to them. One of the most important, and one still heard, is that of heat conductivity. Connecting rod bearing oil temperatures at full throttle operation probably run higher in the average design than temperatures elsewhere. In the average engine also the maximum oil temperature today is running high enough so that oil viscosity is dangerously lowered—reflected in some cases by the adoption of such safeguards as oil temperature regulators and oil coolers.

It was believed that the new liners might further reduce heat dissipation from the connecting rod bearings by the interposition of a small air gap in back of the shell. Somehow or other the new bearings don't seem to have worked out that way, though, according to reports from automobile manufacturers and the bearing producers.

Possibly accounting for this condition may be the better bond obtained between babbitt and steel shell, the decreased thickness of the babbitt itself in the new liners, as compared with a spun or die-cast rod, and the fact that the close tolerances specified virtually allow no gap back of the bearing.

Another objection to the liners was to the effect that they might tend to rotate within the connecting rod big end. Some trouble was experienced with this at first, but was eliminated by the substitution of "ears" on the shells at the parting line, instead of the dowels formerly used in the rod. The importance of this factor, of course, lies in the fact that if the shells were to rotate they would cover the oil hole through the rod and stop the flow of lubricant.

In the service field the objection was raised that the mechanic, used to filing the parting lines of rods to refit them to the crankpin might do the same with the new rods, thereby making the subsequent installation of an interchangeable liner difficult if not virtually impossible. As an answer to this problem it was decided in some cases to insert a small amount of shim material (about .006 in.) on one side of the rod—these shims not encroaching on the liner itself. To take up the rod if desired, the mechanic under these conditions could still remove some shims without damaging the rod.

Further advantages claimed for the use of the new liner over the conventional babbitted rod include the following:

1. By babbitting a uniform thickness of metal instead of a non-uniform forging, uniform cooling of the babbitt is obtainable and therefore uniformity in the crystalline structure of the babbitt.
2. The car owner can be assured of just as perfect rod balance after replacing liners, as before. It is claimed that this is not possible or does not hold true of rods rebabbitted in the field.
3. Decreased value of inventory to be carried by car dealers and distributors for the servicing of connecting rods.
4. Lowering of the time a car is tied up in the shop by eliminating the wait for rebabbitting.
5. Reduction of the time required for disassembly and reassembly, with lowered service cost to the owner.
6. Lowered cost of replacement parts to the owner.

# Town Gas Used as Automotive Fuel

DURING the war, motor buses in London and other British cities were operated on coal gas which was being carried in rubberized bags on top of the vehicles. It was stated at the time that if it were not for the fact that all steel and steel-fabricating plants were needed for the production of war material, the gas would be carried in pressure vessels under high pressure. Immediately after the war, when gasoline became available again, the gas bags were discarded.

Now the city of Birmingham has begun to look into the possibilities of town gas in competition with gasoline, and equipment for installation on an Austin 20 hp. truck has been evolved by the Industrial Research Laboratories of the Birmingham Corp. Gas Works. The gas is stored in five pressure vessels, 8 in. in diameter by 5 ft. 10 in. long, which are carried on the floor of the truck and protected by a wooden casing. The capacity of these bottles is equal to 350 cu. ft. of free gas each, and the gas is compressed in them to a pressure of 3,000 lb. p. sq. in. The total weight of the gas equipment is 645 lb. and the weight of the gasoline tank and gasoline which it replaced was 170 lb., so that the extra weight with gas equipment is about 475 lb.

It was found that the gas consumption is about 21 cu. ft. per mile, for a gas of about 470 B.T.U. per cu. ft., and with a total capacity of 1750 cu. ft., one charge should be sufficient for a trip of 85 miles. At the filling station the empty bottles are removed and replaced by charged bottles, an operation which is said to occupy not more than five minutes. The gas from the bottles is reduced in pressure to about 15 lb. p. sq. in. by a reducing valve on the dash. A combustible mixture is prepared by means of a mixer which was designed by a firm of carburetor manufacturers. The compression ratio of the engine was increased from 4.6 to 5.6 by cutting down the cylinder head. When the engine is stopped the gas supply is shut off by a knob on the dashboard, but it is planned to accomplish this later by an automatic valve actuated by the suction in the inlet manifold.

In a test run between Birmingham and Coventry a maximum speed of 55 m.p.h. was attained with a total weight of 6800 lb., including a pay load of 1680 lb. When operating on gasoline under the same conditions as those which obtained in the test on gas consumption, the consumption is said to be at the rate of 1 Imp. gal. for 12 miles. Thus one Imperial gallon of gasoline is equal to 250 cu. ft. of gas and the cost of the gas would be less than that of gasoline as long as the cost of 1000 cu. ft. of gas is less than that of 4 Imp. gallons of gasoline. However, in view of the fact that the price at which gasoline is delivered in the seaports of Great Britain is only about 20 per cent of that at which it is sold to the final retail consumer, any savings which would be achieved by the use of coal gas would be due mainly to avoidance of the "petrol tax."

# Engineers Still Not Ready to Say YES on Doughnuts

*(Continued from page 159)*

greater scuffing with wide treads, while another found that the scuffing is less with the wider treads provided the geometry of the steering linkage is correct and proper alignment is assured.

Harder steering is commonly regarded as a major objection to larger tire sections. One company found that the installation of semi-low pressure tires (a double oversize) increased steering resistance by 30 to 50 per cent while running, and 100 per cent while standing. Opinions differ as to whether steering "efficiency" must be increased with double oversizes, but it is generally agreed that a change-over becomes necessary with a drop of 5 lb. in tire pressure, which is somewhere between the double and triple oversizes.

Pulling-in of front wheels and straightening up knuckle pins laterally has proved of help in one case, by decreasing the amount of "lift." The wheel lever arm, that is, the distance from the center of tire-ground contact to the point of intersection of the knuckle-pin axis with the road, seems to have little influence on the steering effort required.

## Steering Gear Changes Would Be Needed

Narrow-tread tires reduce the steering effort required, on the whole. It is almost universally agreed that harder steering will require changes in drag link and tie-rod ends, knuckle pins, etc., to reduce wear on these parts.

The most serious complaint in connection with low-pressure tires is that they increase front-end "nervousness." All agree that these tires increase the tendency to shimmy, but one company has found cars equipped with them less sensitive to tramp. A number of apparent anomalies have come to light in this investigation, such as one manufacturer curing a case of front-wheel shimmy by increasing the throw of the kick-shackle, while another achieved the same result by locking it out. One finds increased caster helpful, while another reduces caster and shimmy simultaneously.

Wheel balance becomes more important with a lowering of the tire pressure, and one company sets the maximum out-of-balance permissible at 15 oz.-in. Closer control of front-axle geometry in service also is essential.

Numerous complaints have been received from the field with regard to loosening of steering-gear parts, most of these cases having been called to the attention of the owners by the appearance of shimmy and tramp. This tends to indicate that steering mechanisms in general should be stiffened if low-pressure tires are to be used. On the other hand, a majority of the engineers contacted are of the opinion that the introduction of friction in the steering mechanism for damping purposes is not essential to the control of shimmy, and that the elimination of clearance is the only gain achieved from such a course. One car manufacturer has found that the use of preloaded anti-friction bearings in the steering mechanism not only helps to increase steering efficiency, but also helps to correct "wander," without introducing shimmy.

That low-pressure tires are noisier on turns is generally admitted, and a majority believe that they are noisier also on straightaways, especially on gravel roads and on brick pavements. Further work with different tread patterns, on the part of the tire companies, will undoubtedly reveal possibilities of noise reduction. Several engineers feel that a narrowing of the tire tread would be an improvement from this point of view.

Danger from blow-outs has been another widely discussed point. Whether or not there is an increase in steering-wheel pull at the time of the blow-out (the engineering vote here is 50-50) and whether cars are more or less controllable after they have been righted (the vote here is about three to two in favor of the low-pressure type), the fact remains that at high speed a blow-out is dangerous with either type of tire.

So far wheels and rims for low-pressure balloon tires have been considerably heavier than those for conventional balloons, chiefly because of the increased rim width necessary for lateral stability. Some competent engineers believe, however, that it is possible to reduce weights to near those of the equipment being replaced, especially in the 15-in. size. A lightening of the wheels would help materially with the introduction of the new tires. As to the tires themselves, comparisons of triple oversizes with the tires they replace show weights somewhat in favor of the conventional balloons for smaller cars, and slightly in favor of low-pressure tires in the larger sizes.

Since motor-car manufacturers buy tires largely on weight basis, in the event of their widespread adoption, the new tires would eventually cost little more. Most likely the cost of change-over in the tire industry would be borne by the replacement trade.

As to the immediate future for low-pressure tires, it is the consensus of opinion of all those automobile manufacturers and several of the tire companies contacted by the author, that for cars weighing up to 3000 lb. a triple oversize is all that will be considered. In the range from 3000-3500 lb., some favor a triple, some a double oversize as the maximum. Above 3500 lb. a double oversize limit is favored by most companies, while above 4000 lb. there seems to be fairly general agreement that a single oversize or a six-ply modification with no smaller wheels is all that can be expected. The 8.25-in. tire (nominal size) seems to be the biggest tire that manufacturers are considering.

## Manufacturers Frown on Changeover

Several car manufacturers continue to withdraw their guarantee upon the installation of low-pressure balloons by the owner. Others, while not withdrawing the guarantee, do look with disfavor on such change-overs. Investigations in the field indicate that people who have driven cars with low-pressure tires are not inclined to change back, being willing to accept certain disadvantages for the sake of such gains as they feel they obtain. Replacement sales, however, have dropped off sharply since the peak of last spring and summer.

The next move is definitely up to the car manufacturer. If he can obtain any improvement in riding comfort after the necessary changes have been made to secure acceptable steering and tire mileage, elimination of shimmy and tramp, etc.; if he can take advantage of the slight improvement in traction and the reduction in body rattles accompanying the elimination of many high-frequency vibrations through the use of these tires, without sacrifice in lateral stability, roadability and maneuverability, we will see more models equipped with low-pressure tires in 1934.

# Reaction Gives "Feel" to New Vacuum Brake

THE vacuum power brakes which are being supplied this year by the Bendix Brake Company to a number of automobile manufacturers are of what is known as the reaction type, in which the reaction of the brake pedal on the driver's foot is at all times proportional to the pull on the brake linkage, so that the driver can accurately gage the degree of application. A sketch of the power mechanism of the brake is shown by Fig. 1.

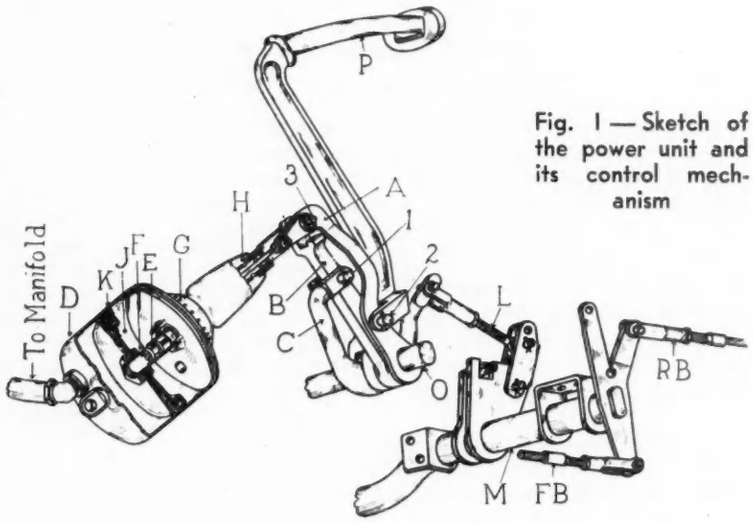



Fig. 1 — Sketch of the power unit and its control mechanism

The power unit consists of the valve-operating lever *A*, the power-unit lever *B*, the bellcrank lever *C* and the vacuum-power unit *D*, the front end of which latter is connected to the frame bracket, while the rear end connects to lever *B*. There is a partial vacuum in the power unit as long as the engine is running.

When the brake pedal is depressed, its initial travel operates the internal valve *E* of power unit *D*. Atmospheric air is admitted to the rear chamber *J* of the cylinder through port *F*, after having first passed through the air filter *G* and the port *H*. The pressure of the atmosphere forces piston *K* forward, thereby actuating the power-unit lever *B*, which transmits the power through bellcrank *C* to main pedal rod *L*, which latter is connected to cross-shaft *M*. However, owing to the fact that the power-unit lever *B* has clearance around the pedal shaft *O* and is pivoted at pin 1, the moment of the pull of piston *K* on the arm of lever *B* above pin 1 is balanced against the interval due to the force exerted through pedal *P* and pin 2 on arm 1-2 of lever *B*.

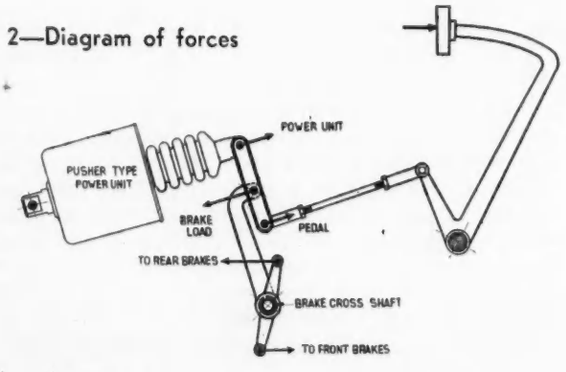
With all parts in the released position valve *E* is held open by the valve-operating lever *A*, and there is a partial vacuum on both sides of the piston in the power cylinder, the two ends of the cylinder now being in communication with each other. The valve-rod yoke is connected to the valve lever without clearance, so that the slightest motion of the pedal moves the valve. To prevent such motion without disturbing the piston, the valve yoke is made with an over-size hole providing clearance around the piston-rod clevice pin 3.

As the brake pedal is depressed, its first motion closes valve *E*, through the lost motion about the piston-pin rod. Atmospheric air is now admitted to the space behind the piston, through the air filter, hollow piston rod and port beneath the valve. This partly destroys the vacuum in the chamber back of the piston, and since the vacuum is maintained in the other chamber of the cylinder the piston is driven forward by the excess pressure behind it.

The piston in consequence pulls on the power-unit lever *B* through the piston-rod clevis pin. Since lever *B* has a clearance around pedal shaft *O*, the pull of the power cylinder is balanced against the pressure exerted through the pedal and pin 2 on the lower end of lever *B*, about pin 1 as a fulcrum, and when the pull of the power unit has built up to balance the pedal effort applied through pin 2, the leverage system is in the neutral or holding position. When the system of levers is in this position the resultant of the pedal pressure and the power cylinder pull is transmitted to bellcrank lever *C* through pin 1, and from it to the brake linkage.

The valve lever being pivoted to the power-unit lever by pin 2, has been rotated to a point where the valve is in the neutral position (with equal clearance on each side of the piston-rod pin 3), with the chambers on both sides of the piston completely sealed. An increase in braking effect is brought about by a repetition of the above operations, any increase in the pressure on the brake pedal admitting additional air.

Fig. 2—Diagram of forces



# BOOK REVIEWS

## High Speed Diesels

In his latest book, High Speed Diesel Engines, P. M. Heldt, engineering editor of AUTOMOTIVE INDUSTRIES, has done for the compression-ignition powerplant what his famous work, The Gasoline Engine, did for the Otto cycle engine. This most recent work on high speed Diesels is characterized by the same careful attention to accuracy and clarity which has featured the author's previous books on automotive engineering.

The new book presents a condensed, orderly review of some of the research work that has been done both here and abroad on problems connected with various phases of design, together with descriptive data and illustrations of typical examples of the various subclasses that have been actually built. Much has appeared on the subect in the periodical press in recent years, but the material is widely scattered, and a good deal of it is printed in foreign languages. Hence it is difficult of access to the majority of those interested in Diesel development in this country. Those interested in design and experimental development of this type of powerplant consequently will find Mr. Heldt's book of great value, as will those who are concerned merely with keeping abreast with developments in this field of rapidly growing importance.

We sent a copy of the book to Dr. H. C. Dickinson of the Bureau of Standards and new president of the S. A. E. and he has sent us the following comments of a member of the Bureau's staff in which he fully concurred.

"The present work supplements the previous justly popular works by Mr. Heldt on the gasoline engine by presenting in the same clear and logical manner the theory and problems peculiar to the design and operation of high speed Diesel engines. Comprehensive, but condensed and free from involved scientific discussions, the book is easy reading and should appeal particularly to the technical man interested in obtaining, with a minimum of time and effort, a broad general knowledge of the present status of this rapidly developing type of engine. Frequent references to the widely scattered sources from which Mr. Heldt has collected his material enable the reader to locate more extended treatments of details in which he may be especially interested. The descriptions and illustrations of the many varieties of spray nozzles, injection pumps and makes and types of engines in use should be of assistance to designers as well as to engineers charged with the selection of the best type of equipment for a particular service."

The book is profusely illustrated and has a good index.

The publisher is P. M. Heldt, 56th & Chestnut Sts., Philadelphia, Pa., and the price is $4.

## Plastic Working of Metals

Plastic Working of Metals, by E. V. Crane, pub. John Wiley & Sons, Inc. $4.

Mr. Crane has produced a book which is not simply a text or reference on the plastic working of metals but rather a highly successful effort to place an important art on a more scientific basis. Power-press operations in general and the stretching of metals in particular, always will involve judgment values but the final results may be much more satisfactory if certain fundamental principles are taken into consideration. That is one of the objectives attained by Mr. Crane. His discussion of every step is lighted by scientific explanation of observed phenomena, mathematical analysis, tables of data, and graphs. Photographs and sketches are introduced to show the construction of dies, etc., lso current types of power press equipment for various kinds of work. The author is a prolific contributor to the trade press and needs no further introduction to people interested in the press shop. His connection with E. W. Bliss and consequent contact with the technical and production problems of the automotive industry confer unusual authority on his work. We recommend this book to those who are interested in fortifying their practical experience with the scientific background paved by many contemporary investigators.

## Development of American Industries

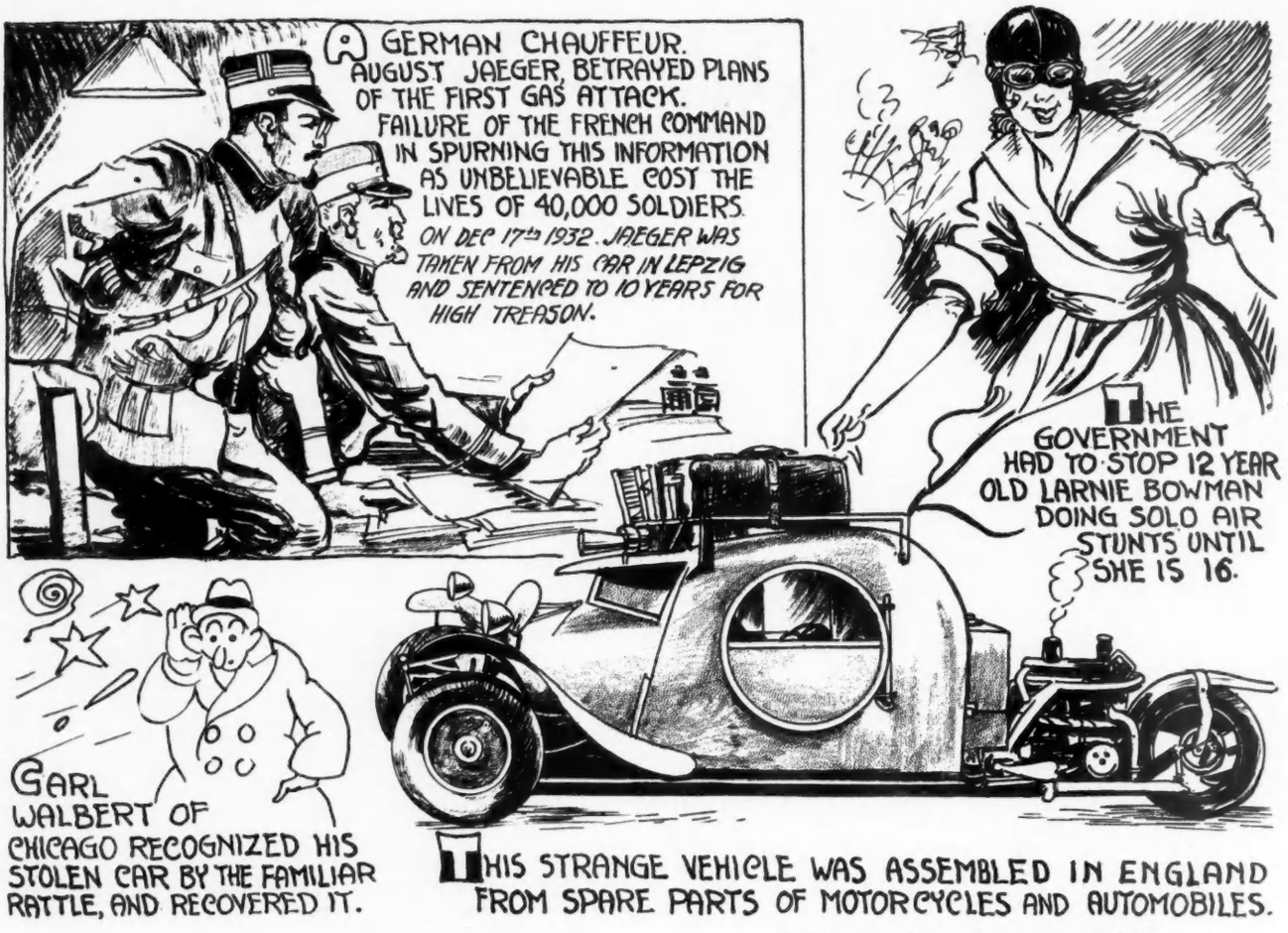
"The Development of American Industries," by Glover and Cornell, pub. Prentice-Hall. 932 pp. 96 charts and tables. $6.

By introducing names that have been associated with the development of important industires, by the generous use of interesting events surrounding the rise of our key industries, the authors have humanized what ordinarily might be simply a good economic history. The idea behind the development of the text is very interesting. It covers the growth of 39 major-industries in the United States, basing the history of each one upon facts and figures compiled by leading figures in the respective industries. Thus Walter P. Chrysler speaks for automobiles; Robt. M. Gaylord, C. R. Burt, and Guy Hubbard for machine tools; and Adolph S. Ochs for the newspaper.

The book deals with the early history of each industry, its growth and leaders, geographic location, raw materials, and the like. It should prove to be a timely guide for those considering the decentralization of industry in that it provides a sure historic background as well as an insight into the many problems involved.

This volume can serve not only as an economic history and encyclopedia but also as a "Who's Who of Industry."

# Automotive Oddities—By Pete Keenan


GERMAN CHAUFFEUR. AUGUST JAEGER, BETRAYED PLANS OF THE FIRST GAS ATTACK. FAILURE OF THE FRENCH COMMAND IN SPURNING THIS INFORMATION AS UNBELIEVABLE COST THE LIVES OF 40,000 SOLDIERS. ON DEC 17th 1932. JAEGER WAS TAKEN FROM HIS CAR IN LEPZIG AND SENTENCED TO 10 YEARS FOR HIGH TREASON.
THE GOVERNMENT HAD TO STOP 12 YEAR OLD LARNIE BOWMAN DOING SOLO AIR STUNTS UNTIL SHE IS 16.
CARL WALBERT OF CHICAGO RECOGNIZED HIS STOLEN CAR BY THE FAMILIAR RATTLE, AND RECOVERED IT.
THIS STRANGE VEHICLE WAS ASSEMBLED IN ENGLAND FROM SPARE PARTS OF MOTORCYCLES AND AUTOMOBILES.

Write us if you know an Oddity

# Quieter Airplanes

FOR the past four years the Aeronautics Branch of the Department of Commerce, through its research division at the Bureau of Standards, has been engaged in the development of practical methods of reducing the noise in airplanes. Recently the Department published a report on a study of airplane mufflers for which seven mufflers were furnished by manufacturers and three experimental mufflers by the research division. Measurements of the reduction in noise and of the reduction in engine horsepower due to the mufflers were made at the engine testing laboratory of the Aeronautics Branch at Arlington, Va., by the wind-tunnel, sound, and engine-testing sections of the research division.

It was concluded from the results of the tests that it is not profitable to use engine mufflers unless the noise of the propeller can also be reduced below the noise level of the unmuffled engine, which in general means that the tip speed of the propeller must be reduced to 650 or 700 feet per second.

The use of a manifold system in itself gives a considerable reduction in noise.

It is possible to reduce the noise of the unsilenced engine (open-port condition) in the absence of the propeller by 15 to 20 decibels by means of a muffler, with an added weight of 30 or 40 lb. and a reduction in engine horsepower of less than 3 per cent.

A study in England reported in a paper by A. H. Davis in the Journal of the Royal Aeronautical Society (Volume 35, 1931, page 676) indicates that the propeller, when of high tip speed is the dormant source of noise in airplanes. The noise level 80 feet from a 2-bladed propeller, 8 ft. 9 in. in diameter, driven electrically at 1860 r.p.m. is stated to be 100 decibels above a reference value of 0.001 dyne/cm$^2$ corresponding to 94 decibels above the reference value of $10^{-14}$ watts per cm$^2$ used in the study of the Aeronautics Branch. The noise level about 80 feet from the unsilenced engine used in the American experiments was 83 decibels. With a propeller giving a noise level of 94 decibels and an engine giving a level of 83 decibels, it is useless to muffle the engine exhaust, the report points out.

# NEWS

## Strike Wave Caused By Outside Leaders

### External Influences Get Blame for Labor Troubles

DETROIT—An investigation conducted by *Automotive Industries* seems to indicate clearly that present labor disturbances in the Detroit area are part of a general program aimed at the industry by an independent group of agitators reported to center in the Communistic Auto Workers Association. This general program is said to include definitely scheduled strikes at virtually every automotive plant in this area. So far body manufacturers have been the main goal in an attempt to cripple production and as offering the best opportunity for organized strike effort.

The Hudson body plant strike which followed strikes at Briggs, Murray and Hayes offers the clearest evidence of all of the influence of communistic activity. Strikes have resulted from

*(Turn to page 181, please)*

## Plymouth Has Big Gain

DETROIT—Shipments of new Plymouth Sixes during the month of January were 285 per cent of shipments during the same month last year. Retail deliveries of Plymouth cars throughout the United States up to and including Jan. 28, were 270 per cent of retail deliveries in the same period of 1932, according to Harry G. Moock, general sales manager.

## January G.M. Unit Sales Largest Since July, 1931

NEW YORK—More General Motors cars were sold to United States consumers in January than in any month since June, 1932. In addition, world sales to dealers and sales to United States dealers reached the highest mark since July, 1931.

January retail deliveries in the United States amounted to 50,653, against 47,942 a year ago, a gain of 6 per cent. Sales to United States dealers were 72,274, as compared with 65,382 in January, 1932. Stocks of new cars in the hands of General Motors dealers in the United States therefore increased 21,621 during the month.

World sales totaled 82,117, as compared with 74,710 a year ago, an increase of 10 per cent.

## Car Sales Better Early '32 Record

### Seven Cities and Two States Report Gains Over Totals Last Year

PHILADELPHIA — Reports from leading cities and from Maryland and North Carolina on January passenger car sales all show gains over last year. While available data are too meager for safe generalization, if these gains are indicative of the situation the country over, January will be the first month since October, 1929, to show a sales gain over the corresponding month of the previous year.

These preliminary returns indicate a domestic sales total for the first month of the year of close to 100,000 passenger cars against 87,000 last year.

This favorable showing is perhaps due in part to the later Chevrolet announcement date and also due to the fact that a new Plymouth model was announced late last year. Moreover, the fact that new Ford models were in the offing, apparently has not had as large a deterring effect as was the case last year.

A disquieting note is injected into the situation, however, by scattered reports indicating substantial increases in dealer used car stocks. Possibly this condition may be attributed to dealers neglecting this phase of their business in their enthusiasm for the new models.

## Chicago Paid Gate Far Ahead of 1932

CHICAGO—Paid attendance at the National Automobile Show ran ahead of last year on every day of the exhibition, according to a statement by Alfred Reeves, show manager, on the closing day. The daily increases were as follows: Saturday, 12 per cent; Sunday, 34 per cent; Monday, 11 per cent; Tuesday, 15 per cent; Wednesday, 11 per cent; Thursday, 68 per cent, and Friday, 41 per cent.

Dramatization of 1933's unusually interesting models coupled with a reduction in the admission fee from 75 to 55 cents are among the reasons assigned for the large attendance gains.

A plan which will permit better control of chassis lecturers, whose over-enthusiastic efforts to secure public attention caused some difficulty, is under consideration by Messrs. Hastings, Erskine and Swayne. This group is also studying the styles of exhibits and their costs to prevent any undue competition in that respect.

Reports on new passenger car sales in January follow:

| | 1932 | 1933 |
|---|---|---|
| Chicago (Cook County) | 2629 | 3216 |
| Detroit (Wayne County) | 2027 | 2375 |
| Cincinnati (Hamilton County) | 488 | 620 |
| Baltimore | 582 | 705 |
| Louisville | 313 | 401 |
| Cleveland (Cuyahoga County) | 928 | 1023 |
| Columbus (Franklin County) | 362 | 425 |
| Maryland | 1286 | 1384 |
| North Carolina | 1231 | 1524 |

## Chevrolet Mercury Reported on the Way

DETROIT—It is reported that several parts producers have received releases for the delivery of parts for 2000 of the Chevrolet Mercury models. It is not believed that these are for immediate assembly in complete cars but the thought is that developments along this line will depend on Ford's activities with lower-priced models.

## Receiver for du Pont Motors

WILMINGTON—S. Scott Baker of this city has been appointed receiver of du Pont Motors, Inc., manufacturer of custom-built automobiles.

## Rail Aid Expected in Tax Diversion Fight

### Pending Bills Need Big Charges to Conform to Joint Committee Report

WASHINGTON, D. C.—Radical revision of highway transport legislation now pending in forty-three state legislatures will be attempted if the spirit of the report of the Joint Committee of Railroads and Highway Users, made public today, is adhered to, is the opinion of Roy F. Britton, director of the National Highway Users Conference which sponsored the highway users group on the joint committee.

In many states there are pending bills which provide for the diversion of the gasoline tax receipts to purposes other than the building and maintenance of highways and bills designed to break down reciprocity agreements. If the spirit of the agreement just reached is maintained, it may be expected that representatives of the railroads, whose efforts in the main have been towards the adoption of these and similar measures aimed at highway transport, and those working in the defense of motor transportation will join in an attempt to have this legislation revised in accordance with the joint agreement.

On those questions which the committee found agreement imposible, it is to be expected that both groups will continue to urge their respective points of view upon the legislative groups.

## Pierce Arrow Uses Bohnalite

Bohnalite aluminum alloy pistons with invar struts are being used in all current models of Pierce Arrow passenger cars.

## Would End Air Mail Subsidies

WASHINGTON, D. C.—All subsidies to air mail lines will be eliminated by 1941, according to a plan tentatively agreed upon by the House Post Office committee. The plan provides fo ra gradual elimination of the subsidy so that its removal will not have too drastic an effect on air line operations. About 25 per cent of the air mail lines now in operation would be put upon a self-sustaining basis immediately.

## Ludlum Names Templeton

WATERVLIET, N. J.—C. B. Templeton, formerly assistant to the president f othe Ludlum Steel Co., is now assistant to the vice-president in charge of sales.

In addition to other duties, Mr. Templeton will have charge of all advertising activity.

## Would Have State Do Own Inspecting

BALTIMORE, MD.—Under the terms of a bill that has been introduced in the Maryland General Assembly the Commissioner of Motor Vehicles would be required to operate and maintain in each city of the state of 25,000 inhabitants or more at least one machine for testing headlights, brakes and alignment of wheels of motor vehicles and that they be used in connection with making the annual inspections in the Save-a-Life campaigns. They would be operated by members of the State Police force or other employees of the commissioner and the tests would be made without expense to the owners of the motor vehicles.

## Citroen Priced at $835 Will Be Made in Germany

WASHINGTON, D. C.—A new car to sell at around $835 is planned by the German Citroen Co., according to the Automotive Division of the Department of Commerce from Assistant Commercial Attache Douglas Miller, Berlin.

With the exception of the body, the car will be manufactured in Germany. German sheet steel will be sent to France, the body made there and reimported into Germany.

Production of the new car in Germany will begin some time in March.

## Airplane Parts Exports Increase

The United States exported more airplane parts in 1932 than in the previous year, according to the Aeronautics trade division of the Commerce Department.

Total exports of parts were valued at $1,756.421, compared with $1,521,828 in 1931. This classification includes all parts for replacement, and materials entering into the making of complete aircraft, such as dopes, shock absorbers, wheels, propellers and similar items.

## New Studebaker Distributor

ALBANY, N. Y.—Burlingame Motors, Inc., has been appointed Studebaker-Rockne distributor for Albany, Rensselaer, Greene, Schoharie and Schenectady counties. The new distributorship is headed by Wescott Burlingame, who handled the Cadillac line here for many years.

## Defiance Reports Deficit

TOLEDO, O., Jan. 30—A deficit of $11,672 for the fiscal year ending Nov. 30, 1932, is reported by the Defiance Spark Plug Corp. This compares with net before taxes of $136,344 in 1931.

## Breer Special a Custom Job

The most recent fruit of the enthusiasm Chrysler Engineer Carl Breer has for building motor cars is the "Breer Special," which his young sons are proudly driving around Detroit. This is strictly a "custom job," and there is no immediate prospect of its going into production. Mr. Breer reports that operation and maintenance costs are very satisfactory, in itself an important item as he has to foot the bills.

Power for the "Breer Special" is furnished by a one-cylinder Briggs-Stratton self-contained motor of the type used on power lawn mowers, developing about five horsepower at 4000 r.p.m. Tubes form the frame of the car. The transmission is of the standard three-speed type and, like the springs, it was salvaged from a motor car company that had to fold up.

Tires are of the airplane balloon type 16 x 4 in. The car has a wheelbase of 60 in. and a tread of 30 in., just about half the size of a regulation automobile.

The "Breer Special" has a set of Michigan license plates, which together with the state license fee, based on weight, horsepower, etc., cost $2.10. The car is fully protected by insurance, for which the owner paid $6.34 for complete liability coverage and $1.81 for fire and theft.

# General Motors Continues 25 Cent Common Dividend Despite Profit Drop to $164,979

NEW YORK—Subject to final audit, net earnings of the General Motors Corp. for the year ended Dec. 31, 1932, including equities in the undivided profits or losses of subsidiary and affiliated companies not consolidated, amounted to $164,979. At the same time it was announced that regular quarterly dividends of 25 cents per share of common and of $1.25 on the $5 preferred, would be paid.

The preliminary figures, which are summarized in the following table, reveal that despite sever shrinkage in sales, the liquidity of the corporation has been maintained and that conservative depreciation policies have been continued:

| | 1931 | 1932 |
|---|---|---|
| Net earnings | $96,877,107 | $164,997 |
| Depreciation real estate, plants and equipment | 37,965,731 | 37,173,647 |
| Preferred dividends | 9,375,899 | 9,206,387 |
| Common dividends | 130,500,001 | 53,993,330 |
| Net charge to surplus | 42,998,793 | 63,034,738 |
| Cash and securities | 205,029,119 | 172,780,695 |
| Net working capital | 273,915,923 | 225,437,194 |
| Total sales — cars and trucks* | 1,074,709 | 562,970 |
| Sales to U. S. dealers | 928,630 | 472,859 |
| Sales to U. S. users | 937,537 | 510,060 |
| Decrease in U. S. dealer stocks | ..... | 37,201 |

*Includes foreign sales.

## Studebaker Reduces Bank Loans $3,875,000

SOUTH BEND—Studebaker total bank loans are today $4,525,000 against $8,400,000 in October, 1932, a decrease of $3,875,000, according to A. R. Erskine, president. Combined bank balances and marketable securities of Studebaker Corp. and White Motor Co. are about $8,200,000. These figures do not include Pierce-Arrow Motor Car Co.

Total amount of present salary rolls in Studebaker and Pierce-Arrow is approximately 25 per cent below 1932 and 55 per cent below 1929. January performances were above the budget. White Motor Co. budget for 1933 contemplate marked reduction in losses due to merger and general economy.

The annual report of the Studebaker Corp. is expected to be out before March 1.

## Budd Manufacturing Loss

PHILADELPHIA—The Edward G. Budd Mfg. Co. reports a net loss of $1,785,757 for the year ending December 31, 1932, against a deficit of $730,412 in the previous year.

## Perry Leaves S.A.E. Journal

After serving the Society of Automotive Engineers for eight years on the editorial staff of the *S.A.E. Journal*, during the last five years in charge of the editorial department, H. W. Perry resigned on Jan. 26. Prior to joining the staff of the Society, he was connected for eight years with the National Automobile Chamber of Commerce in the multiple capacities of secretary of the motor-truck, highways, legislation and export committees and manager of the public-information department. During 1919 and 1920 he was general manager of the Trailer Manufacturers Association of America.

## Arkansas Halves Car License Fee

LITTLE ROCK, ARK.—Effective immediately, passenger car license fees are cut in half, as the result of a bill just signed by the governor. On automobiles four or more years old, the reduction amounts to 75 per cent. If the new fee basis fails to produce expected revenue, the governor states that he will approve a supplemental bill calling for a lesser reduction in license fees.

## Rowell Gets K. C. Post

DETROIT — The appointment of H. M. Rowell to the post of Kansas City regional manager is announced by A. vanDerZee, general sales manager of Dodge Brothers Corporation.

## Ryan Joins Wheels, Inc.

NEW YORK — Fred J. Ryan, one of the oldest accessory distributors in the Metropolitan area, has joined forces with Wheels, Inc. Mr. Ryan takes to the new concern the products of Bendix Brake, Stromberg Carburetor, Pines Winterfront and Houdaille Shock Absorbers.

## Detroit Air Show Unlikely

DETROIT — In accordance with the general economy program of the Aircraft Bureau of Detroit Board of Commerce, it has been learned that in all probability the National Aircraft Show will not be held this year.

No definite decision has been reached on plans for a National Air Tour.

## Business in Brief

### Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

There was practically no change in general business last week. In the East and West the weather was unseasonable and retarded the movement of winter goods. The heavy industries remained dull, with the shoe and textile industries making the best showing. A measure of optimism, however, is based on the fact that the gains in many branches of trade and industry during the last half of 1932 make the business situation considerably more promising than a year ago.

#### FREIGHT DECREASE

Railway freight loadings during the week ended Jan. 28 amounted to 472,088 cars, which marks a decrease of 24,346 cars below those during the preceding week, a decrease of 88,255 cars below those a year ago, and a decrease of 247,309 cars below those two years ago.

#### FARM PRODUCTS AT NEW LOW

The United States Department of Agriculture's index of farm prices on Jan. 15 stood at 51 per cent of the pre-war average, a new low, as against 63 per cent a year ago.

#### PRODUCTION OF POWER

Production of electricity by the electric light and power industry in the United States during the week ended Jan. 28 was 7.5 per cent below that a year ago.

#### LUMBER ORDERS UP

New orders booked by the lumber industry during the week ended Jan. 28 were the largest for any week during this year. Production during that week was 8 per cent below that a year ago, and new business was 22 per cent below.

#### CRUDE OIL PRODUCTION

Average daily crude oil production during the week ended Jan. 28 amounted to 2,008,700 barrels, as against 2,015,300 barrels for the preceding week and 2,170,800 barrels for a year ago.

#### FISHER'S INDEX DROPS

Professor Fisher's index of wholesale commodity prices during the week ended Feb. 4 stood at 55.3, as against 55.5 the week before and 56.4 two weeks before.

#### BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended Feb. 1 were 24 per cent below those a year ago.

#### STOCK MARKET BREAKS

The stock market last week suffered a bad break. Fluctuations were within a narrow range in the earlier part of the week, but the report at the close of business Tuesday that the quarterly dividend on United States Steel preferred stock would be reduced precipitated sharp declines. As prices receded, the volume of trading increased and most issues registered net losses for the week.

#### FEDERAL RESERVE BANKS

The consolidated statement of Federal Reserve banks for the week ended Feb. 1 showed little change. Holdings of Government securities and bills bought in the open market remained practically unchanged, and holdings of discounted bills increased $3,000,000. The reserve ratio on Feb. 1 was 65.6 per cent, as against 65.4 per cent a week earlier and 64.7 per cent two weeks earlier.

## Rim Inspections Drop 10 Per Cent in January

CLEVELAND—Rims inspected and approved in January by the Tire and Rim Association amounted to 727,308 against 810,759 a year ago, a drop of 10 per cent.

Inspections of 17, 18 and 19 in drop center rims declined from 688,959 to 567,993 and of flat base 17, 18, 19, 20 and 21 in. balloon rims from 27,794 to 7050. These losses were offset in part by inspection of 57,119 low-pressure 15 and 16 in. balloon rims, against none of this type a year ago.

Truck rim inspections, on the other hand, increased from 88,419 to 93,729.

## Trucks Rush Pacific Eggs For New York's Breakfast

SAN FRANCISCO—One hundred refrigerator trucks, each with a capacity of 20 tons, will be used in transcontinental service enabling the delivery of Pacific Coast laid eggs in Atlantic Seaboard markets in seven days' time, it has been announced. Cooperating in the new service will be the firms of Nye & Nissen of San Francisco and Salt Lake City; the Puget Sound Egg Packers of Seattle and Baum & Moncharsh of New York City.

Transportation costs will be decreased, time will be saved and the sale of coast eggs in eastern markets will be increased 100 per cent through the new truck service, it is stated by backers of the project. The service is expected to start in April.

## Tumbler Opens in Toronto

TORONTO—The latest American company to be established in Canada is the J. A. Tumbler Laboratories of Baltimore, Md., which has organized a branch at Toronto to supply the Canadian and export trade. The company produces a variety of polishes, wax and dressings for automotive vehicles.

## Federal Appoints Dahlberg

LANSING, MICH.—William H. Dahlberg, who has been connected with the Michigan Screw Co. for the past twenty years, has been named sales manager for the Federal Drop Forge Company.

## Floor Plan Financing Per New Car Bought By Dealers Increases from $257 to $263

WASHINGTON, D. C.—A reduction of 43.6 per cent in the gross dollar volume of retail financing and of 40.4 per cent in wholesale financing in 1932 as compared with 1931, is indicated by the full year figures on automobile financing issued by the Department of Commerce. Used car financing was off 38.1 per cent.

Wholesale financing per car sold by factories to dealers increased from $257 to $263, reflecting the somewhat greater dependence of dealers on floor plan for inventory financing during the year just ended.

The average new car note was $546 last year against $554 in the preceding year, the difference being due partly to lower car prices and also probably to somewhat smaller average down payments. The average used car note dropped from $268 in 1931 to $241 in 1932.

Although it is impossible to determine accurately from these figures just what percentage of new car sales were on the instalment plan, the indications are that the percentage of new cars financed declined about three per cent in 1932 as compared with 1931.

| | 1930 | 1931 | 1932 |
|---|---|---|---|
| WHOLESALE FINANCING— | | | |
| Totals | $ 660,978,901 | $554,440,655 | $330,267,440 |
| RETAIL FINANCING—Totals | | | |
| No. of Cars—New and Used | 2,933,973 | 2,448,245 | 1,521,920 |
| Amount | $1,201,341,267 | $950,301,958 | $535,594,706 |
| Per Car | $409 | $388 | $352 |
| *New Cars* | | | |
| No. of Cars | 1,287,796 | 1,006,875 | 537,955 |
| Amount | $ 730,417,562 | $558,158,290 | $293,780,083 |
| Per Car | $567 | $554 | $546 |
| *Used Cars* | | | |
| No. of Cars | 1,558,932 | 1,370,655 | 938,287 |
| Amount | $ 435,989,399 | $366,774,095 | $226,574,726 |
| Per Car | $280 | $268 | $241 |
| *Unclassified* | | | |
| No. of Cars | 87,245 | 70,715 | 45,678 |
| Amount | $ 34,934,306 | $ 25,369,573 | $ 15,239,897 |
| Per Car | $400 | $359 | $334 |

## Exchange Barriers Halt British Entry

### Favorable Tariffs Offset by Basing Rates on High Value of Canadian Dollar

TORONTO—English makers are delaying their entry into the Canadian market action in the hope that the Canadian government would reduce the abitrary value of the pound sterling for duty purposes. For some time past Canadian duties have been imposed on British products on the basis of $4.40 for the pound for the alleged purpose of preventing what might be the next thing to "dumping." This has proved a formidable barrier to British cars despite other concessions. It has also been stated that Canadian distributors have been in touch with British manufacturers of popular cars but that prices quoted have made it impracticable to bring cars into the Dominion under present conditions. The fact that the British pound is currently worth around $4 in Canada has not made it easy to arrange Canadian distribution.

It is known that the Austin company has obtained data on sheet metal and wage costs in Canada with a view to establishing an assembly plant in the Dominion. The Morris company has shown interest in the Canadian market, while Armstrong Siddeley Motors, Ltd., Ottawa, has considered the introduction of the Armstrong Siddeley car in Canada.

The M.G. company has already appointed one Canadian agent, and the price quoted in Canada for the M.G. midget two-seater is $1,088, with taxes paid. M.G. models were also exhibited at the recent Montreal Motor Show and, for the first time in many moons, a British car advertisement appeared in the daily press in Canada in connection with that exhibit.

In Canadian trade circles it has been figured that probably the cheapest price at which a British small car (not including the baby models) can be sold at retail in the Dominion is $836, with freight and sales tax extra. This price is immediately in competition with those for Ford, Chevrolet, Plymouth, Overland, etc., and for these there is established service. Small car competition in Canada is keen and, therefore, it is stated that British manufacturers must take steps to insure service in the Dominion in order to get a real foothold.

## Budd Wheel Reports Deficit

PHILADELPHIA—A net loss of $1,387,189 is reported for the year ending December 31, 1932, by the Budd Wheel Co. This compares with a profit of $182,674 in 1931. Preferred dividends were paid last year amounting to $28,535 bringing total deductions from surplus to $1,415,724.

## New Curtiss-Condor is Tested

Turning over one of the three-bladed propellers on the new Curtiss "Condor," 15-passenger transport, before pressing the starter button preparatory to first test flight at Lambert-St. Louis Field. Nine of the "Condors," costing $60,000 each, have been ordered by Eastern Air Transport and Transamerican Airlines.

## Pontiac January Sales Run Ahead of Last Year

DETROIT—R. K. White, sales manager for Pontiac, has reported a substantial sales increase for January, both locally and nationally.

Complete new car registration figures for Detroit and Wayne County give Pontiac third place in sales volume. Its Wayne County total of 248 new cars sold during January was exceeded only by two manufacturers of lower priced cars and compares with 93 cars during January, 1932, for Wayne County.

Nationally, the sales reports from 14 key cities throughout the country plus the Wayne County totals, give Pontiac 46 per cent of its price class, excluding the very lowest price cars. In January, 1932, Pontiac's percentage of price class for the corresponding cities was 33.

## Six Indians to Escort Mexico's President

SPRINGFIELD, MASS.—The Indian Motorcycle Co. of this city, through James A. Wright, sales manager, announces the delivery in Mexico City of a fleet of six special high-powered Indian motorcycles of 74 cu. in. piston displacement to be used exclusively as official escort for President Abelardo Rodriguez. The motorcycles, which have a speed of 90 m.p.h., are in silver finish and each carries the insignia and grand seal of the Republic of Mexico.

## Benjamin Joins Klemm

W. E. Benjamin, formerly sales engineer, Pierce Governor Company, has joined the KLEMM Automotive Products Company of Chicago, manufacturers of the KLEMM Cheat Proof Governor. Mr. Benjamin has been appointed sales engineer in charge of the eastern division.

## Toledo Steel Products Sales Up

TOLEDO — Toledo Steel Products Co. reports 14 per cent greater dollar sales volume for the last six months of 1932 than for the similar period in 1931.

## Five New Distributors

INDIANAPOLIS — Bert Dingley, vice-president in charge of sales of the Marmon-Herrington Co., reports the appointment of new distributors in Indianapolis; Seattle, Wash.; Lincoln, Neb.; Calumet, Mich., and Boise, Idaho.

## Motor Fatalities Down 13 Per Cent

### Drop Twice as Large as Decline in Car Use

Deaths in motor vehicle accidents declined during 1932, for the first time in history. The estimated total for the year is only 29,500 deaths, compared with 33,740 in 1931. There were 12,542 deaths in 1920; 21,877 in 1925.

This decline in motor fatalities of approximately 13 per cent means a saving of over 4000 lives, compared with 1931, and brings the annual total to the lowest point since 1928, when there were 27,996 deaths.

The estimated death rate per 100,000 population is 23.6, compared with 27.2 in 1931; this is the lowest recorded since 1928 when the rate was 23.3. The death rate per 100,000 cars registered is 121.5, compared with 130.7 in 1931; this is the lowest since the 1929 rate of 116.6. The rate per 10,000,000 gallons of gasoline consumption is 20.6, compared with 21.9 in 1931; the 1932 figure is a new low.

In other words, the 1931-32 percentage decline in motor vehicle deaths was about twice as great as the six per cent drop in motor vehicle registration or the 6.84 per cent decline in gasoline consumption (comparative 10 months' figures). Since these two factors are the best indicators of motor vehicle travel, it seems certain that the 1932 drop in deaths is partially due to a real advance in the safe use of streets and highways.

In addition to the fatalities, 1932 motor vehicle accidents were responsible for at least 1,000,000 non-fatal injuries, based on the common ratio of 35 non-fatal injuries for each death. The economic loss resulting from these injuries and deaths, including wage loss, medical expense, and overhead insurance cost (but not property damage), may be roughly estimated at $600,000,000.

## Tanner Heads Chevrolet and Pontiac Production

DETROIT—Floyd O. Tanner, vice-president and general plant manager of Pontiac Motor Co., has been named director of manufacturing for Chevrolet and Pontiac with offices in Detroit, according to an announcement by C. E. Wetherald, vice-president and general manufacturing manager, Chevrolet Motor Co.

P. H. MacGregor, formerly general superintendent of Chevrolet Motor Co., Flint, succeeds Mr. Tanner in Pontiac. Mr. MacGregor returned to Pontiac as general superintendent with Mr. Tanner in the spring of 1932. Before joining Chevrolet in 1925, he was general superintendent of the Oakland Motor Car Co.

# Demand for Steel Holds About Even

## Acute Competition of Large and Small Mills Tends to Soften Prices

NEW YORK — Steel demand is holding its own. Some who indulge in from day-to-day estimates of the rate of steel-making operations profess to see a slight tapering off in automotive takings of steel and ascribe to this slightly lowered activities in the Cleveland district, but nearby Youngstown, Pittsburgh and Chicago are credited with having registered gains. There is also some talk that certain buyers are withholding orders for flat-rolled steel, until the market gives better indication of having touched bottom. Automotive consumers have in no wise altered their policy of confining their purchases to scheduled requirements and unsettlement of prices in the sheet market has not had the slightest effect on the rate or manner in which commitments are being placed. Softness of prices has resulted solely from more acute competition on the part of large as well as small mills. The larger producers are intensively going after every single ton of business that overhangs the market and their greater aggressiveness is not much relished by the smaller mills. As a natural sequel to the $5 per ton decline in cold-rolled sheets last month, the price of cold-rolled strip steel is none too strong, the 1.90c., Pittsburgh, quotation being largely nominal. Gossip in the trade has it that only one mill was affected by the labor dispute at the Briggs and Murray plants to the extent of a temporary shutdown. Ford releases, however, are reported to be coming through as usual this week and heavier shipments to Chevrolet are in sight. Wire and wire products are in light demand following the recent flurry resulting from a downward movement in price.

**Pig Iron**—While January pig iron statistics show a slight increase in blast furnace operations, this improvement resulted solely from better operations at steel plants, the extent of merchant furnace output being little affected. The market is unchanged with automotive foundries ordering foundry and malleable irons in a routine way.

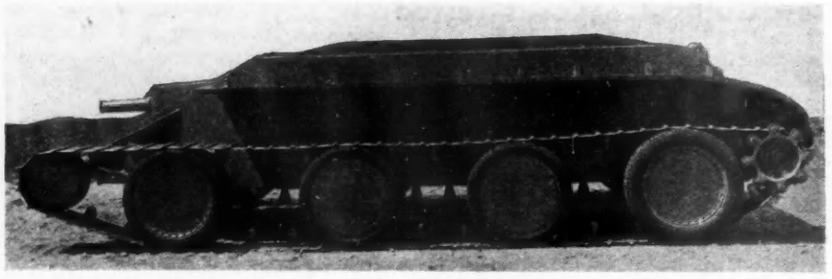
**Aluminum** — Estimates compiled by a metal market authority indicate production of approximately 105,000,000 pounds of aluminum in the United States last year, a decrease of 40% from the 1931 output and comparing with 230,000,000 pounds in 1930 when the heaviest domestic production was recorded. Middle West secondary specialists complain of keen competition from the East.

**Copper** — Second quarter deliveries of electrolytic copper are now freely offered at 5 cents, delivered Connecticut Valley, and if there were any third quarter demand, it could be satisfied on the same price basis.

**Tin**—Sharp advance in the Sterling exchange market sent the week's opening price for prompt Straits up to 23¾ cents.

**Lead**—Steady and unchanged.

**Zinc**—Some producers are offering Prime Western at as low as 2¾ cents, East St. Louis.



Christie tank designed for transportation by airplane

## Chevrolet at Highest Level Since July, 1931

DETROIT — Chevrolet January production 64,594 units against 40,056 for December and 52,465 for January last year, is largest for any single month since July, 1931. Fifty-eight thousand four hundred went to domestic dealers and balance to Canadian and overseas markets. February operations are forecast as at least 50,000 on present schedule against last year's February total of 42,000. Factory payrolls total approximately 34,000, with additional 23,000 working at Fisher on Chevrolet bodies.

## *George V. Davis Clarke*

DETROIT — George V. Davis Clarke, 35 years old, assistant statistician for Chrysler Corp., died February 6 in Jordan Hospital, following on operation for appendicitis. He had been associated with the Chrysler Corp. for nearly four years.

## AC Cuts Regular Line Plugs to 60 Cents

DETROIT—Price reductions have been announced by AC Spark Plug Co. on complete line of plugs. The regular line effective March 1 will list at 60 cents. Former 90-cent heavy-duty plugs are reduced to 75 cents and radio plugs from $1.25 to 90 cents. Corresponding price reductions to trade became effective February 6. This represents first change in prices since 1926 when last reduction was made.

## Austin Commitments Lower

PITTSBURGH—The new management of the American Austin Car Co., Inc., has liquidated a major part of its commitment for materials amounting to $1,250,000. According to a statement recently issued this company produced an average of 600 cars a month during the last 5 months of 1932. A total of 3846 cars was produced in 1932, 1279 in 1931 and 8558 in 1930. A majority of the cars sold during the past year went into the Southern states.

## Christie Develops New "Flying" Tank

### Designed to Be Carried by Large Bombing Planes

LINDEN, N. J.—J. Walter Christie, veteran builder of front-drive equipment and noted for his development of army tanks and special track-laying machinery for ordnance, showed his latest combat machine to a small group of technical men who visited the plant of the U. S. Wheel Track Layer Corp., Linden, N. J. The present machine weighs 5½ tons and, when powered by a 400-hp. engine, is capable of a speed of 62 m.p.h. on its track; 100 m.p.h. on rubber tires. It is designed for mounting all types of rapid fire guns up to 75 mm. and is armored against 30-calibre machine-gun armor-piercing bullets.

The high-speed combat machine is rather unique in its conception. Not only is it a weapon of offense in the usual sense, but is arranged for transport by special bombing planes which will pick it up by means of a flying attachment, transport to a given point, and release to the ground. The speed of 62 m.p.h. on caterpillars is sufficient to give the bomber its necessary take-off speed.

Each wheel is independently sprung on a special, patented coil spring arrangement, which permits of wide limits of deflection. The front steering wheels are sprung on a horizontal spring mechanism. In the latest design, the track is a drop forging with the lug integral. Incidentally, the lugs, which are guided between the dual tires on the wheels and the guide wheels at both ends, aid remarkably well in keeping the track in place at high speeds.

Mr. Christie is now working on a redesign of this machine in order to bring down its weight to 3½ tons. It is said that the lighter machine can be readily handled by the bombing planes now in service.

## Brill Reports Loss

NEW YORK—J. G. Brill Co. and subsidiary companies report an operating deficit of $1,186,782 for the year ended Dec. 31, 1932, against a deficit of $997,666 in 1931.

## Strike Wave Caused by Outside Leaders

*(Continued from page 175)*

intimidation of workers rather than from a general opposition of labor to present wage scales and working conditions.

Hudson today called for a committee representing the strikers to which the company gave its response to the strikers' demands. A general call to return to work tomorrow was also issued as a result of production getting under way once more on a limited scale so far at the company's body plant.

Picketing of the Briggs Highland Park plant has been apparently completely abandoned and work there on Ford bodies is rapidly reaching normal rate. At the Mack plant picketing and intimidation of workers continues with injuries resulting from clashes between strikers and workers and state and city police forces.

Production at the Ford Motor Co., abandoned coincidentally with the start of the Briggs strike, has been resumed and has reached a sufficient rate to permit of carrying through announcement of the new cars almost on schedule. The interim has been beneficial in permitting Ford dealers to dispose of more of their stock of unsold cars.

Whether or not strikes scheduled for the next two weeks will become effective depends largely on the moves at present being made by manufacturers in anticipation of an attempt to induce workers to quit. Restriction of production and staggering of employment are two moves adopted by manufacturers in an effort to anticipate action on the part of the organized agitators.

## *Pinaire, Saxon and Benson*

DETROIT — Owen Pinaire, chief test pilot, Arthur Saxon, chief engineer, and Sam Benson, assistant chief engineer of the Stinson Aircraft Corp., all were killed on Feb. 8 in the crash of an experimental trimotor plane.

## Van Norman Reelects Officers

SPRINGFIELD, MASS.—Van Norman Machine Tool Co., at its annual meeting reelected its old officers and directors. Charles E. Van Norman is president and treasurer; Frederick Van Norman is vice-president and secretary, and James Y. Scott is second vice-president.

## Williams M.E.M.A. Director

NEW YORK—J. Harvey Williams, president of the J. H. Williams Co., New York, N. Y., has been named to the board of directors of the Motor and Equipment Manufacturers Association to take the place made vacant by the resignation of W. C. Allen.

## Commercial Credit Reports Net Profit

BALTIMORE — A consolidated profit of $297,982 is shown in the report of the Commercial Credit Co. for the year ending December 31, 1932, after deducting operating expenses, interest and discount charges, Federal taxes, net losses in excess of reserves and the setting up of a special reserve of $1,200,000 for probable abnormal losses. Minority interest and preferred dividends of subsidiaries are not included. The earnings for 1931 were figured at $3,778,406. Deductions for minority interest and preferred dividends of subsidiaries give a net income for 1932 of $142,336 which is the equivalent of 64 cents a share on 66,282 shares of 6½ first preferred and 155,682 shares of 7 per cent first preferred stock.

## N.S.P.A. and Commerce Dept. Join in New Service

DETROIT—A Merchandising Information Service has been set up in the offices of the National Standard Parts Association with the cooperation of the United States Department of Commerce. The new service is planned to enable the business man to obtain a more complete merchandising information service through the medium of his own trade organization.

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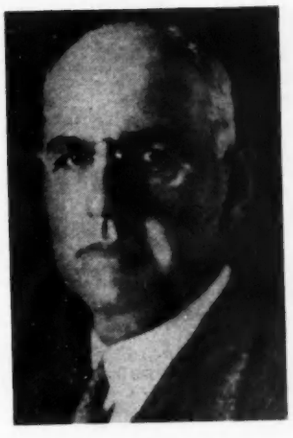
# Senate Calls Motor Magnates in Recovery Quest

**Alfred P. Sloan, Jr.**
President
General Motors Corp.

**Lamont DuPont**
Board Chairman
General Motors Corp.



**Alvan Macauley**
President
Packard Motor Car Co.

**Alexander Legge**
President
International Harvester Co.

Who have been requested, with 51 other outstanding men of the country, by the Senate Finance Committee, to present their views on the causes of the present depression and possible remedial legislation. The committee hearings will begin on Feb. 13.

## Sigfred Johnsen Organizes New Company

WAUSAU, WIS. — Sigfred Johnsen, who recently withdrew from the Wausau Motor Parts Co., which he founded about 10 years ago, has organized the Johnsen Piston Ring Co., capital stock $25,000. Mr. Johnsen is president and general manager of the new corporation, and Irving Walker is vice-president.

## R. & H. Chemical Absorbed

WILMINGTON, DEL.—The Roessler & Hasslacher Chemical Company, a subsidiary of E. I. du Pont de Nemours & Company, Inc., has been dissolved and business transferred to the parent organization. The former company now operates as an industrial department of the du Pont Company and is known as the R. & H. Chemicals Department. The executive offices are now located in Wilmington, Del. The business is being operated and managed by the same personnel as before.

## Dodge Dealers Sell 68.4 Per Cent More

DETROIT—Dodge dealers' retail sales of Dodge and Plymouth passenger cars and Dodge trucks during the month of January exceeded deliveries made during January, 1932, by 45 per cent. Also deliveries of Dodge passenger cars and Dodge trucks and Plymouth deliveries by Dodge dealers during the past 60 days were 68.4 per cent higher than in the corresponding 60-day period ending Jan. 31, 1932.

## Seven Jobbers Elected Members of the M.E.W.A.

The Motor and Equipment Wholesalers Association announces that the following automotive jobbers have become members: Auto Parts Co., Reading, Pa.; Chas. Shick & Co., Trenton, N. J.; Klein Auto Parts Co., Wilkes-Barre, Pa.; McLennan, McFeely & Prior, Ltd., Vancouver, B. C.; Garage Supply Co., Ltd., Toronto, Ont.; Samuel Trees & Co., Toronto, Ont., and Cutten & Foster, Ltd., Toronto.

## M.E.W.A. Issues "Tall Timbers"

CHICAGO—The Motor and Equipment Wholesalers Association has issued a booklet entitled "The Tall Timbers," containing the hitherto unpublished address delivered by B. W. Ruark, general manager of the association, at a special meeting held in Detroit during the Automotive Exposition last December. The booklet is primarily an elaboration of the 14-Point Program of the M.E.W.A.

## *Mathew Markey*

DETROIT—Mathew Markey, 73 years old, died suddenly Friday morning at the home of his daughter, Mrs. Irving T. Gillian.

Besides his daughter, he is survived by two sons, Peter A. Markey, vice-president and treasurer of the Bohn Aluminum & Brass Corp., and Terence A. Markey, traffic manager of the Capital Brass Corp.

## Mattingly Removed

ALLEGAN, MICH.—Removal of L. H. Mattingly, Sr., from the presidency of Blood Brothers Machine Co. has been directed by the court in a suit brought by minority stockholders charging misuse of company funds and mismanagement.

## New Dardelet License

NEW YORK—The Russell, Burdsall & Ward Bolt & Nut Co. of Port Chester, N. Y., has been licensed by the Dardelet Threadlock Corp. to manufacture and sell "Rivet-Bolts" and other bolts and nuts with the Dardelet Self-Locking Thread.

## Waste Goes to Dallas

C. A. Waste, formerly of Oklahoma City, Okla., has been appointed supervisor of service for the Dallas Motors, Inc., Pontiac dealers in Dallas, Tex.

## CALENDAR OF COMING EVENTS

**FOREIGN SHOWS**

Berlin International .....Feb. 12-22

**SHOWS**

Kansas City Automobile Show.Feb. 11-18
Toledo, Ohio, Automobile Show.Feb. 11-18
Camden, N. J., Automobile Show Feb. 15-18

**MEETINGS**

National Metal Congress, Detroit Oct. 2-6
Rapid City, S. D., Automobile Show Feb. 14-18
Peoria, Ill., Automobile Show..Feb. 15-19
Wichita, Kans., Automobile Show Feb. 21-24
Holyoke, Mass., Automobile Show .....Feb. 22-25
Evansville, Ind., Automobile Show Feb. 24-26
Albany, N. Y., Automobile Show Feb. 25-Mar. 4
Seattle, Wash., Automobile Show Feb. 26-Mar. 4
Des Moines, Iowa, Automobile Show .....Feb. 27-Mar. 4
Am. Society Testing Materials, New York .....Mar. 8
U. S. Chamber of Commerce Meeting, Washington, D. C.....May 2-5

## Advertising to Have Own Supreme Court

### Review Board Formed to Act on Complaints

NEW YORK—Tentative approval has been given to a plan to have a review board with Ralph Starr Butler as chairman to consider cases regarded as violating sound advertising practice, by the Association of National Advertisers. The board consists of 15 members, advertisers, agencies and publishers, each having five representatives. Final approval awaits the approval of operating details which are now being worked out.

The new board will consider violations of the advertising code only after the National Better Business Bureau has been unable to effect a satisfactory arrangement with the advertiser.

The code drawn up by the advertisers and agencies classifies as tending to discredit advertising the following practices:

False statements or misleading exaggerations.

Indirect misrepresentation of a product or service through distortion of details, either editorially or pictorially.

Statements or suggestions offensive to public decency.

Statements which tend to undermine an industry by attributing to its products, generally, faults and weaknesses true only of a few.

Price claims that are misleading.

Pseudo-scientific advertising, including claims insufficiently supported by accepted authority or that distort the true meaning or application of a statement made by professional or scientific authority.

Testimonials which do not reflect the real choice of a competent witness.

## Kearney & Trecker Get Japanese Order

MILWAUKEE — Kearney & Trecker Corp., 6784 West National Avenue, Milwaukee, has received an order for 15 milling machines, together with a considerable quantity of special tooling, high-speed cutters, etc., valued at $80,000, from the Japanese industrial group, Mitsubishi Shoji Kaisha, Ltd., Tokio.

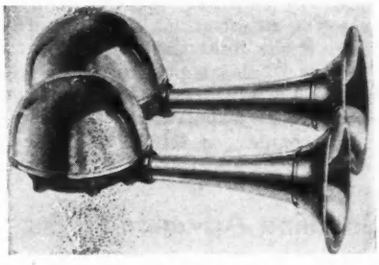
## Solar Corporation Centers Activities

MILWAUKEE — Consolidation of the general offices and storage battery plant, formerly located at Beaver Dam, Wis., and the paint and industrial finish factory, formerly at Minneapolis, in a new plant here, has been completed by the Solar Corp. The Beaver Dam factory was almost totally destroyed by fire in October. The concern specializes in making heavy-duty batteries.

# NEW DEVELOPMENTS
## Automotive Parts, Accessories and Production Tools

### Klaxon 33

FIVE new automobile horns have been brought out for the 1933 season by the Klaxon Division of Delco-Remy Corp., Anderson, Ind. One of these, the Klaxon 33 is said to have a louder and smoother tone than any previous Klaxon. It is nicely proportioned, with clean, sweeping lines, and.



in either the single horn or in the matched set of two horns, comes complete with floor button, wiring and mounting brackets for quick installation.

Other new horns in the Klaxon line are the elbow-type Klaxon "26-F" for the conservative car; the low priced "31-C" in a new tear-drop design; the "26-C", fully chromium-plated with a shortened, spun band-instrument brass trumpet to keep it back of the bumper line and the "29," also more compact, to meet today's demands for conservation of space ahead of the radiator.

All new Klaxon horns are available in single units or matched pairs.

### National Gear Finishing Machine

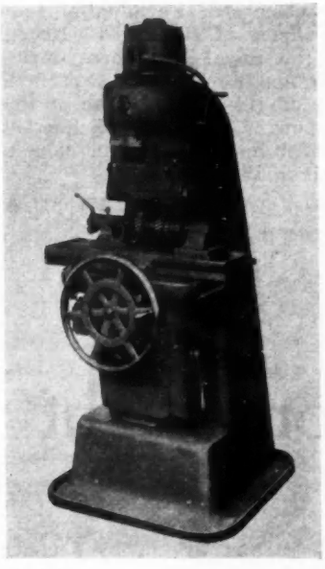
The National Broach & Machine Company, Detroit, Mich., in bringing out its new Red Ring Gear Finishing Machine, opens up new possibilities in this field, both as to accuracy and production economy.

Gear teeth processed on this machine are said to be corrected in profile to within 0.0001+ in. of a true involute curve. At the same time, the index eccentricity and helical angle of the gear are likewise corrected and each tooth surface is made smooth and bright.

This machine cuts at an angle to the axis of the gear and generates the shape of each tooth in the same direction as that taken by the teeth of two mating gears sliding over one another. The operation of the Red Ring machine is fully automatic, requires no particular skill or judgment in its routine handling and may be set to take off any predetermined amount of stock from the gear teeth being processed. One ordinary machine operator can readily serve a battery of these machines.

This new process is claimed to reduce floor-to-floor time about 90% over that required to finish a gear with light cuts on a standard gear-cutting machine. For instance, a 20-tooth gear, having 9.25 pitch, 20° pressure angle and 35° helix angle, can be completely processed in from 20 to 40 seconds, depending on the amount of stock to be removed.

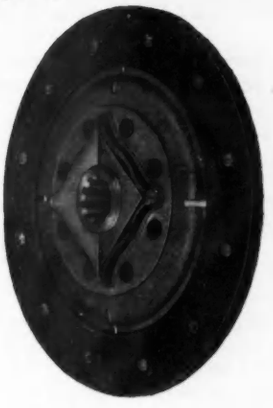
The underlying principle of this machine is the controlled action at high speeds of a special cutting tool in the form of a gashed helical gear. This tool, mating with and guiding the gear being processed, removes thousands of very fine shavings from the work gear in bringing it to the desired accuracy of profile.



Obviously, the cutting edges will not remain permanently sharp, although each set will handle between 300 and 500 units before grinding becomes necessary. The sharpening operation is merely that of face grinding the sides of the slot to a depth of 0.005+ in. Each slot is capable of approximately 10 such grindings. A cutter with five slots would therefore take 50 grindings and could be counted on to finish between 15,000 and 25,000 work units, depending on their individual characteristics.

### Aero-Flex Clutch Disk

The AERO-FLEX Full Floating Hub Clutch Disk was on display for the first time, at Detroit, during the week of the Joint Trade Show, where it was met with a hearty and enthusiastic greeting by Parts Jobbers from all over the United States and Canada. Its sponsors, the Es-M-Co Auto Products Corporation, 33 Thirty-fourth Street, Brooklyn, New York, claim it to be constructed to afford freedom from vibration at all speeds and to assure smooth clutch action under all conditions. They provide a very unusual guarantee with this clutch plate.



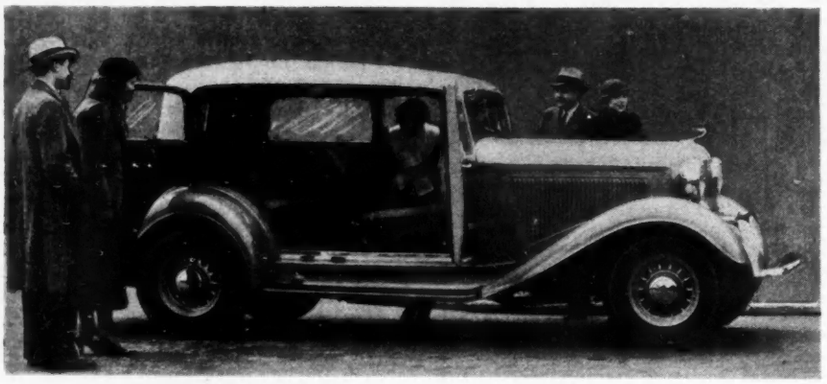
From the illustration, showing a cut-out of the Hub Housing, it may be observed that this product appears to be very simple in construction, consisting chiefly of a Full Floating Hub, machined from an SAE 1035 Drop Forging, surrounded by four specially designed Chrome Vanadium steel springs. These parts are protected by a substantial housing, and, on the Fly Wheel Side, are protected by a reinforcing disk to insure greater strength. Exposed parts, such as the housing and reinforcing disk, are Cadmium plated for protection against oxidation.

The manufacturers contend that the design of the AERO-FLEX plate successfully meets the demand, on the part of car owners and manufacturers, for ruggedness in performance and long life.

### A New Coated Electrode For Manganese Welding

A new coated electrode for manganese welding, designated as Type W-85, has been announced by the General Electric Co. This new wire finds its principal application in the building up of worn manganese steel castings to original dimensions and in the repair of such fractured parts. It also can be readily applied to obtain a manganese steel surface on parts of ordinary steel and iron, thereby giving the parts a tough, work-hardening, wearing surface at a low cost. Other applications are in the reclaiming of worn equipment.

## De Soto Pillarless Sedan



New DeSoto four-place, pillarless sedan listing at $925. Doors lock top and bottom. The interior is finished in leather up to the belt.

## Hall Lamp Reports Loss

DETROIT—C. H. Hall Lamp Co. has reported net loss as of Dec. 31, 1932, amounting to $131,957, compared with a net loss of $275,218 for 1931.

Current assets as of Dec. 31, 1932, were $1,040,710 and current liabilities $58,857 against $1,148,764 and $25,945 respectively a year previous.

## Ewald Heads A.F.A. Committee

DETROIT—Henry T. Ewald, president of Campbell-Ewald Co., has been named chairman of the program committee for the 29th annual convention of the Advertising Federation of America, to be held in Grand Rapids, June 25th.

## Graham Production Increased

DETROIT—Graham Paige February reduction schedule has been increased again with shipping orders at end of first week in February amounting to more than 70 per cent of production volume for month.

## *Capt. Adrian Reeves*

DETROIT, Feb. 7—Capt. Adrian Reeves, one of the operators of National Air Service and prominent in Detroit air circles, died Saturday at his home near Farmington, following an illness of six weeks. He enlisted in the Royal Air Force during the war and was made a captain at the age of 19. At the close of the war he flew on the first mail line between London and Cologne, and came to Detroit in 1922.

## Rogers Heads M.E.M.A. 1933 Show Committee

NEW YORK—Mason T. Rogers, vice-president of the Multibestos Co., North Cambridge, Mass., has been named chairman of the 1933 M.E.M.A. Trade Show Committee. Other members are: C. P. Brewster, K-D Mfg. Co., Lancaster, Pa.; C. C. Secrist, Victor Mfg. & Gasket Co., Chicago; G. W. Sherin, E. I. duPont DeNemours & Co., Wilmington, Del.; and F. G. Wacker, Automotive Maintenance Machinery Co., Chicago.

Although no definite decision has been made on the time and place for the 1933 Trade Show, Chicago is favored at the present time.

The directors also made it clear that while they would go right ahead with plans for an M.E.M.A. Show, they will continue to keep the door open for negotiations for a continuation of the joint shows.

There is also a possibility that the M.E.M.A. will revive the summer conventions which were so popular in the industry a few years ago.

## Deadline Advanced

MADISON, WIS.—The Wisconsin Legislature has advanced the deadline for obtaining 1933 automobile licenses from February to April 1 in order to keep thousands of cars on the road and preserve state receipts from the gasoline tax of 4c. per gallon. Only 87,500 new licenses had been issued Feb. 1. Last year 587,000 cars were registered in all. This number included 25,541 new passenger cars. New car registrations in 1931 numbered 47,536.

# The Newest Ford Eight

*(Continued from page 161)*

proved and wind resistance reduced by means of aprons over the fuel tank.

Naturally, there is considerably more room in the bodies, and while the increase in wheelbase is 6 in., the bodies are over 11 in. longer.

Instrument boards are decidedly more attractive than anything Ford has offered in the past. They are of steel construction with walnut graining on the de luxe models. Instruments are mounted on a steel engine turned panel with rustless steel beading, directly in front of the driver. A glove or tool compartment is provided on the right side of the instrument board. A concealed ash tray and cigar lighter at the center is provided in the de luxe models.

Windshields are hinged at the top and are controlled by a centrally located handle operating in the same manner as a window lift. The speed of the windshield wiper is now controlled by a lever in the windshield header bar.

Front seats in the two-door sedan, slide forward as the back is folded down so as to facilitate entry to the rear of the car.

In the de luxe models, side lights, arm rests, two rear lights, twin horns, shatterproof glass throughout, ash trays and lighters and a rustless steel frame for the windshield are provided. On the standard models, shatterproof glass is used in the windshields.

Full-length bumpers, front and rear, are provided. These are of the single-bar type, with a slight dip at the center.

# The Greatest Opportunity of the Year

!

Spring Maintenance Number

and

1933 Service Manual

## AUTOMOBILE TRADE JOURNAL
## APRIL—1933

It's time for you to sell when your trade is forced to buy—and that's just the time it is in the automotive maintenance field today.

And so—the APRIL Issue of AUTOMOBILE TRADE JOURNAL is the greatest issue of the year for advertisers: (a) because its timeliness makes immediate action necessary, and (b) because its 32 pages of Service Manual will prolong its life a year.

Nearly 60% of All This Year's Maintenance Work Will Be Done In 6 Months—Starting April 1st

# Give Her The Gas In April!

AUTOMOBILE TRADE JOURNAL

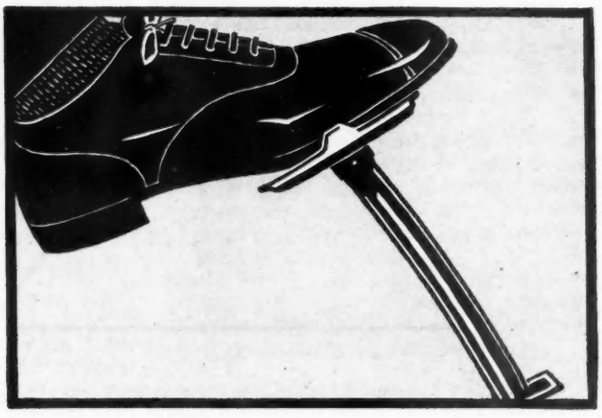
*A Chilton Publication*

Chestnut and 56th Sts. — — — Philadelphia, Pa.

# What is a "FULL

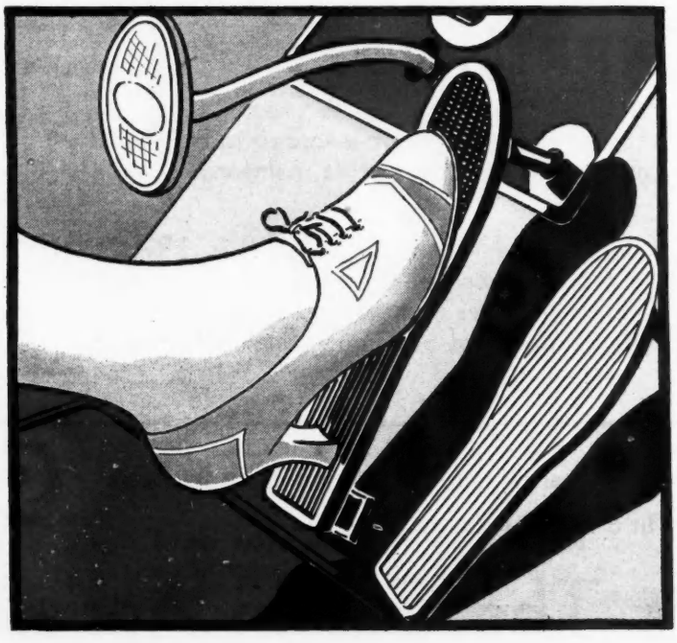
### THE "HUMAN POWER" BRAKE PEDAL

This high, clumsy brake pedal is the sign of the brake system which depends upon brute force and direct leverage for applying the brakes. The time required to get the foot up on this brake pedal, the split-seconds lost and the effort required for the lunging leg action makes these pedal operated brakes unsuited for heavy cars traveling at today's high speeds.



### THE "PARTIAL POWER" BRAKE PEDAL

Still looks like the old fashioned brake pedal, but employs vacuum or other booster devices to help out leg muscle in applying the brakes. Driver loses precious split-seconds in getting his foot up on this high pedal—and spends extra time, extra muscular effort in the longer pedal action required to apply the brakes. Partial Power Brakes are a compromise that falls short of the goal desired.



### THE MODERN *"FULL POWER"* BRAKE PEDAL

This brake pedal, no higher than the foot accelerator, is the unfailing sign of Stewart-Warner Automatic "Full Power" Brakes. *All* the work of braking is done by the Power Unit. Driver's foot on this pedal simply controls the flow of power to the brakes with the same easy rocking motion that the foot on the accelerator controls the flow of power from the engine. In a flash the driver's foot rotates from the accelerator to brake pedal and he is braking before he could even get his foot up on a high, old-fashioned brake pedal. This is the greatest contribution to safe car control in all motor car history. *Make the test for yourself!*

# STEWART-WARNER

# POWER "Brake

## A Question That Vitally Concerns All Car Manufacturers Who Are Interested In Keeping Step With Today's Needs

Make no mistake, this will be a power brake year. Today's high speeds, today's high powered cars, today's free wheeling, today's increase in women drivers, *demand* power brake protection.

But get this straight—there is a big difference between "*full* power" brakes—and so-called "power" brakes, which are in reality only partial power brakes.

A "*Full* Power" Brake System—such as the Stewart-Warner—is not a compromise. It does *all,* not just part of the work of braking. The force is supplied by a Power Unit. The brake pedal is simply a regulator to *control* the *application* of power.

In a "*partial* power" brake, the application of the brake depends upon the driver's leg muscle assisted by vacuum or other booster devices.

The Stewart-Warner Automatic "Full Power" Brake is the most outstanding brake development in history. It is the only instantly responsive braking system to harness the giant power of car momentum as a braking force—and put it under complete control of the driver.

It is the quickest acting, most accurately controlled brake on the market today. Braking force, in amplified response to the slightest variation of pedal pressure, is automatically distributed uniformly to all four wheels. Automatically braking force on front wheel brakes releases in proportion to the angle of turning.

Pierce-Arrow, seeking the ultimate in brake protection to meet today's needs, chose Stewart-Warner "Full Power" Brakes.

For motor cars, motor coaches and trucks, they offer outstanding economy and safety advantages over any system on the market. Investigate. Our Engineers are at your command. Stewart-Warner Corp., Brake Division, Chicago, U. S. A., or 6050 Cass Avenue, Detroit.

© 1933—S. W. Corp.

**Stewart-Warner Automatic "FULL POWER" Brakes Will Do More To Boost Car Sales Than Any Other Feature**

*Automatic*
**"FULL POWER" BRAKES**

**DEOXIDINE**— Prepares Auto Bodies for Painting
**RODINE**— Pickle Bath Control
**STRIPPLE** High Speed Enamel Remover
**PEROLINE**— Rust Preventing Oil
**KEMICK**— Manifold Paint
**FLOSOL**— Soldering Flux
**PARADOX**— Rust Proofing Enamel
**AMERICAN CHEMICAL PAINT CO.**
AMBLER, PENNA.

**STAMPINGS**
WORCESTER STAMPED METAL © · QUALITY STAMPINGS
Heavy, medium and light stampings in any quantity. A steady flow of production—*when* you want it.
WORCESTER STAMPED METAL CO. Worcester, Mass.

**EF** ELECTRIC AND FUEL FIRED FURNACES
AND MATERIAL HANDLING EQUIPMENT
LOWER COSTS — The ELECTRIC FURNACE Co. SALEM OHIO

**DIAMOND** Vulcanized Fibre
Sheets, rods, tubes, washers and special shapes, to meet every insulating need
Also CELORON Timing Gears and DILECTO.
CONTINENTAL-DIAMOND FIBRE CO.
Newark, Delaware

**NAME PLATES** — ALL KINDS
Vitreous enameled, embossed, bronze, chrome plated, brass, etc.
Tell us the purpose and we will design a plate for your approval.
THE D. L. AULD CO.
COLUMBUS, OHIO

**BAKER**
DRILLING : BORING and TAPPING EQUIPMENT
A complete line including gear or hydraulic feed, single or multiple spindle; vertical, horizontal and way type.
BAKER BROTHERS, INC. TOLEDO, OHIO

# BUYERS' GUIDE

## Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Page 39

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

**Arms & Knuckles, Steering**
Atlas Drop Forge Co.

**Axles**
Atlas Drop Forge Co.
Spicer Mfg. Corp.

**Bending & Straightening Machines**
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

**Blanks**
*Forged*
Atlas Drop Forge Co.

**Boring Machines**
Baker Brothers, Inc.
Foote-Burt Co.

**Brake Boosters**
Bendix Aviation Corp.
Stewart-Warner Corp.

**Brake Drums**
Gunite Foundries Corp.

**Brake Testers**
Bendix Aviation Corp.

**Brakes**
*Mechanical*
Bendix Aviation Corp.
Spicer Mfg. Corp.
Stewart-Warner Corp.

**Bumpers**
Stewart-Warner Corp.

**Bushings**
*Fibre*
Continental-Diamond Fibre Co.

**Cable, Brake or Cutout Control**
Wickwire Spencer Steel Co.

**Camshafts**
Atlas Drop Forge Co.
Gunite Foundries Corp.

**Carburetors**
Bendix Aviation Corp.

**Castings**
*Gray Iron*
Gunite Foundries Corp.

**Channels for Glass**
*Felt*
American Felt Co.

**Cleaners**
*Metal*
American Chemical Paint Co. (Rust Preventive)

**Connecting Rods**
Atlas Drop Forge Co.

**Counters**
Veeder-Root, Inc.

**Couplings, Shaft**
Spicer Mfg. Corp.

**Crankshafts**
Atlas Drop Forge Co.

**Cutters**
Baker Brothers, Inc. (Keyseating)
Fellows Gear Shaper Co. (Gear)

**Drilling Machines**
Baker Brothers, Inc.
Foote-Burt Co.

**Enamels**
American Chemical Paint Co. (Rust Proofing)

**Felt**
American Felt Co.

**Fenders**
Motors Metal Corp.

**Fibre Rods, Sheets, Tubes**
Continental-Diamond Fibre Co.

**Forgings**
Atlas Drop Forge Co.

**Furnaces, Electric**
*(Annealing, Carburizing, Heat Treating, Forging & Welding)*
Electric Furnace Co.

**Gaskets**
*Felt*
American Felt Co.

**Gear Cutting Machines**
Fellows Gear Shaper Co. (Shapers)

**Gear Material**
*Non-Metallic*
Continental-Diamond Fibre Co.

**Gears, Timing**
*Non-Metallic*
Continental-Diamond Fibre Co.

**Grinding Machines**
Fellows Gear Shaper Co.

**Hammers, Power**
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

**Heat Treating**
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.

**Heaters, Car**
Stewart-Warner Corp.

**Hoods**
Motors Metal Corp.

**Hose, Flexible Metallic (Radiator & Fuel Lines)**
Titeflex Metal Hose Co.

**Hubs, Wheel**
Gunite Foundries Corp.

*(Continued on page 38)*

P&J FOR OVER A QUARTER OF A CENTURY P&J

THE PIONEER MANUFACTURER OF AUTOMATIC CHUCKING EQUIPMENT

POTTER & JOHNSTON MACH. CO.
PAWTUCKET, R. I., U. S. A.

Steam Cooling
PRACTICALLY ELIMINATES CRANKCASE DILUTION

Rushmore Laboratory
PLAINFIELD • NEW JERSEY

Crankshafts BY ATLAS

Final inspection of Atlas multiple-throw crankshaft

A perfect multiple-throw crankshaft is the standard of excellence in drop forging manufacture. Atlas grew up with, and helped materially in evolving the modern crankshaft. Atlas skill, which aided so effectively in this most difficult achievement, is imparted to 340 other types of drop forgings, ranging from two ounces to 500 lbs., and used by sixty-four manufacturers of highly diversified products.

ATLAS DROP FORGE CO.
LANSING, MICH.

IS IT NEW?... *but above all*
IS IT IMPORTANT?

These are the twin standards by which articles appearing in *Automotive Industries* are selected. The importance of the men who read the publication makes such selection of paramount interest to them. The readers of *Automotive Industries* are key men in automotive plants; men who control purchasing power. They favor an automotive publication which is terse, accurate, dependable. *Automotive Industries* meets the needs of such men in hundreds of automotive manufacturing plants in the United States and in more than a score of foreign countries.

AUTOMOTIVE INDUSTRIES

*Thirty-fourth year*

*A Chilton Publication*
Chestnut and 56th Streets
PHILADELPHIA

*Cable address: "Autoland"*

CHAMBERSBURG-NATIONAL
COMPLETE FORGING EQUIPMENT
CHAMBERSBURG ENGINEERING CO. CHAMBERSBURG, PA.
THE NATIONAL MACHINERY CO. TIFFIN, OHIO
Sales Offices
NEW YORK, 152 W. 42nd St. CHICAGO, 565 W. Washington St.
DETROIT, 2457 Woodward Ave.

FELT
AMERICAN FELT CO.
NEW YORK DETROIT CHICAGO

PIG IRON
SEMIFINISHED STEEL
BARS & SHAPES
SKELP
SHEETS
PIPE
SPECIALTIES
ENDURO-REPUBLIC'S PERFECTED STAINLESS STEEL
AGATHON ALLOY STEELS
REPUBLIC STEEL CORP.
YOUNGSTOWN, OHIO

CASTINGS
EST. IN 1854
GUNITE . . . . . Z-RON
MALLEABLE . GRAY IRON
GUNITE FOUNDRIES CORP., ROCKFORD, ILLINOIS

FENDERS
DUST SHIELDS
RUNNING BOARD SHIELDS
HOODS
RUNNING BOARDS
RADIATOR SHELLS
BODY STAMPINGS
MOTORS METAL MFG. CO.
5936 Milford Ave. Detroit, Mich.

Pioneers in Better Drilling Methods
FOOTBURT
Single and multiple spindle special drilling, boring, reaming, tapping machine and FOOTBURT Sipp Sensitive Drilling Machines
THE FOOTE-BURT COMPANY CLEVELAND, OHIO

## BUYERS' GUIDE—Continued

(*Continued from page* 36)

**Insulating Material**
Continental-Diamond Fibre Co.

**Keyseaters**
Baker Brothers, Inc.

**Lapping Machines**
Fellows Gear Shaper Co.

**Lathes**
*Automatic Chucking*
Potter & Johnston Machine Co.
*Turret*
Potter & Johnston Machine Co.

**Molded or Machined Parts (Phenolic)**
Continental-Diamond Fibre Co.

**Name Plates**
Auld, D. L., Co.

**Odometers**
Veeder-Root, Inc.

**Pads**
*Felt*
American Felt Co.

**Paints**
American Chemical Paint Co. (Heat Resisting)

**Pickling Compounds**
American Chemical Paint Co.

**Piston Rings**
Perfect Circle Co.

**Plates, Clutch Pressure**
Gunite Foundries Corp.

**Presses**
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

**Radiator Shells**
Motors Metal Corp.

**Removers, Enamel & Paint**
American Chemical Paint Co.

**Running Boards, Metal**
Motors Metal Corp.

**Rust Removers & Preventives**
American Chemical Paint Co.

**Screw Machine Products**
Barnes, Wallace Co.

**Screw Machines**
Potter & Johnston Machine Co.

**Shafts, Axle, Propeller & Transmission**
Spicer Mfg. Corp.

**Shock Absorbers**
Stewart-Warner Corp.

**Special Machinery**
Baker Brothers, Inc.

**Speedometers & Tachometers**
Stewart-Warner Corp.

**Springs**
*Extension, Compression, Torsion or Flat*
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Raymond Mfg. Co.
Wickwire Spencer Steel Co.

**Stampings or Drawings, Metal**
Auld, D. L., Co.
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Motors Metal Corp.
Raymond Mfg. Co.
Wickwire Spencer Steel Co.
Worcester Stamped Metal Co.

**Starter Drives**
Bendix Aviation Corp.

**Steam Cooling**
Rushmore Laboratory

**Steel**
*Alloy*
Illinois Steel Co.
Republic Steel Corp.
*Bars*
Illinois Steel Co.
Republic Steel Corp.
*Billets*
Illinois Steel Co.
*Carbon*
Illinois Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel Co.
*Cold Drawn*
Republic Steel Corp.
Wickwire Spencer Steel Co.
*Electric Furnace*
Illinois Steel Co.
*Shapes*
Illinois Steel Co.
Wickwire Spencer Steel Co.
*Spring*
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.
*Stainless*
Illinois Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel Co.
*Strip*
Illinois Steel Co.
Republic Steel Corp.
Wickwire Spencer Steel Co.

**Tapping Machines**
Baker Brothers, Inc.
Foote-Burt Co.

**Thread Generators**
Fellows Gear Shaper Co.

**Tubing**
*Flexible Metal*
Titeflex Metal Hose Co.

**Turret Machines, Automatic**
Potter & Johnston Machine Co.

**Universal Joints**
Spicer Mfg. Corp.

**Vacuum Tanks**
Stewart-Warner Corp.

**Washers**
*Felt*
American Felt Co.

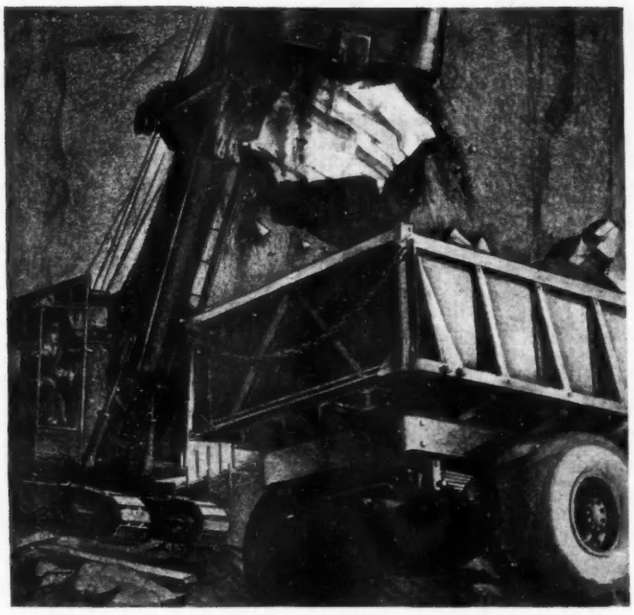
**Welding Material (Wires)**
Wickwire Spencer Steel Co.

**Wicks**
*Felt*
American Felt Co.

**Windshield Wipers**
Stewart-Warner Corp.

**Wire**
*Flat, Round, Square or Special Shape*
Barnes, Wallace Co.
*Spring*
Barnes, Wallace Co.
Republic Steel Corp.
Wickwire Spencer Steel Co.

**Wrenches**
Gunite Foundries Corp.



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# Index to Advertisers

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A

American Chemical Paint Co. ..... 36
American Felt Co. ... 38
Atlas Drop Forge Co... 37
Auld, D. L., Co. ..... 36

B

Baker Brothers, Inc.... 36
Bendix Aviation Corp., Front Cover
Brown-Lipe Gear Co... 1

C

Chambersburg Engineering Co..... 38
Continental - Diamond Fibre Co. ..... 36

E

Electric Furnace Co. .. 36

F

Fellows Gear Shaper Co. ..... 2
Foote-Burt Co. ..... 38

G

Gunite Foundries Corp. 38

I

Illinois Steel Co. (Subsidiary of United States Corp.) ..... 39

M

Motors Metal Mfg. Co.. 38

N

National Machinery Co. 31

P

Parish Pressed Steel Co. ..... 1
Perfect Circle Co., Third Cover
Potter & Johnston Machine Co. ..... 37

R

Republic Steel Corpn.. 38
Rushmore Laboratory. 37

S

Salisbury Axle Co. .... 1
Spicer Mfg. Corp..... 1
Stewart-Warner Corp., 34-35

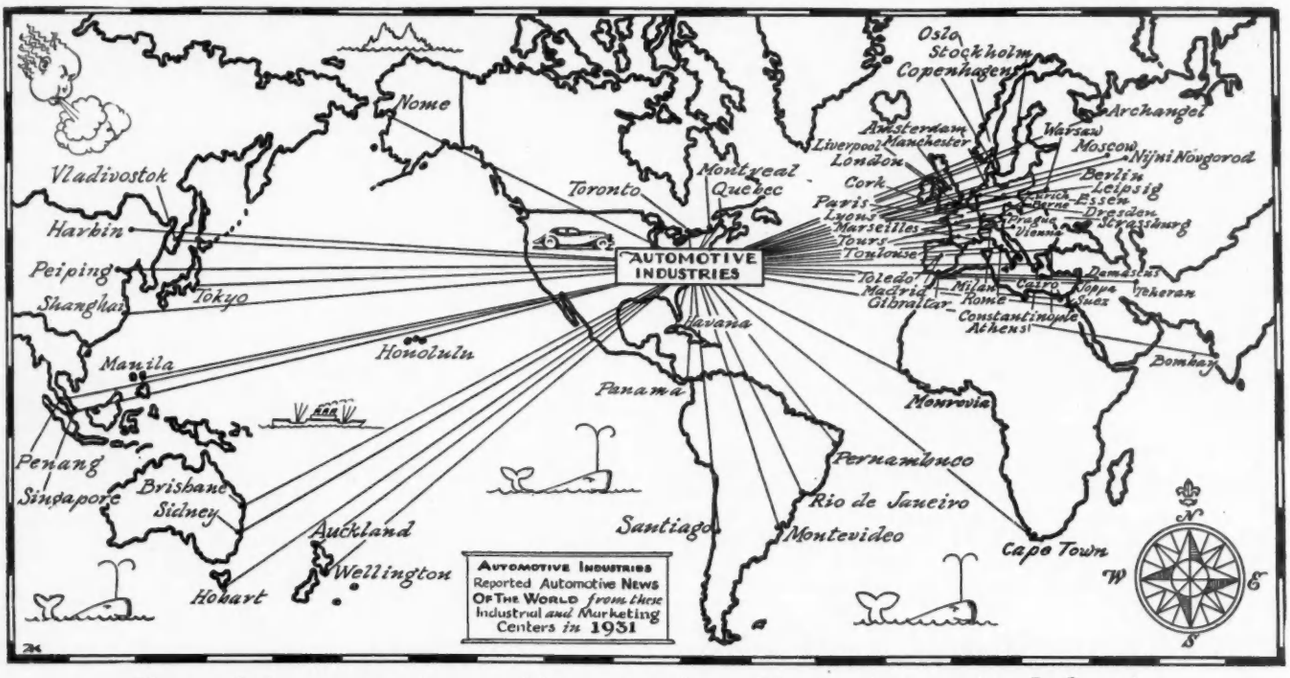
V

Veeder-Root, Inc..... 39

W

Wickwire Spencer Steel Co. .....Back Cover
Worcester Stamped Metal Co. ..... 36

# What about the *other* Detroits?

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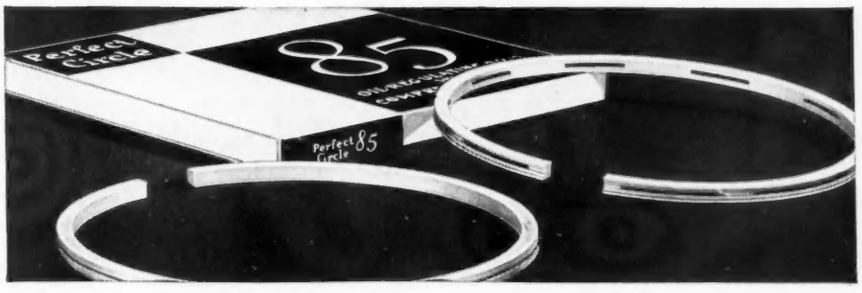


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